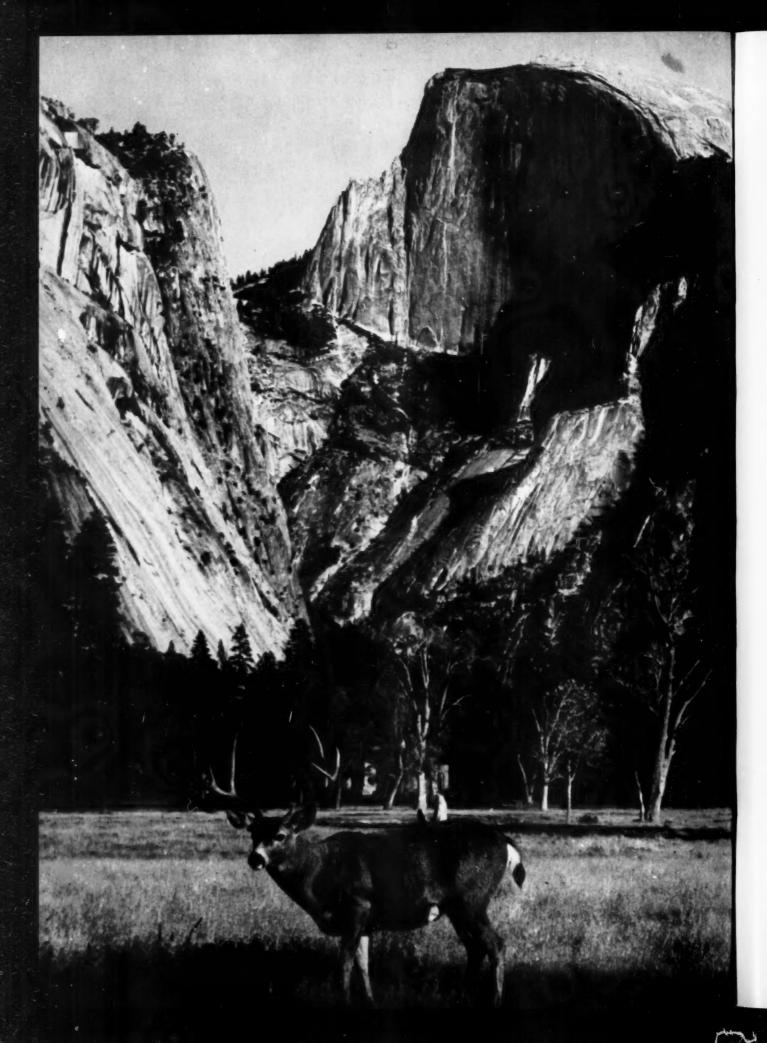
PUBLIC HEALTH REPORTS

In this issue



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Preserving the scenic beauty of the Nation is the aim of the antilitter drive waged by thousands of communities (see page 387).

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U. S. DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE

ARTHUR S. FLEMMING, Secretary

PUBLIC HEALTH SERVICE

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RESIDUAL FUMIGANTS

Their Potential in Malaria Eradication

WILLIS MATHIS, B.S., RICHARD W. FAY, Ph.D., H. F. SCHOOF, Ph.D., and K. D. QUARTERMAN, M.P.H.

RESIDUAL fumigants offer a new technique of vector control which is potentially capable of revolutionizing the insecticidal approach to malaria eradication.

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Current malaria eradication programs depend primarily on interrupting the transmission of the disease through the use of residual insecticides, chiefly DDT and dieldrin. Although considerable success has been achieved with this method during the past decade, similar accomplishment in some areas is being hampered by (a) development of vector populations resistant to these insecticides, (b) variation in the efficacy of residues caused by the type of surface to which they are applied, (c) destruction or removal of the insecticidal deposits by replastering, washing, or other modifications of the treated surfaces, and (d) variation in the behavior of the mosquitoes. Consequently, a method which would reduce or eliminate the influence of any of these factors would hasten the achievement of the ultimate goal of global malaria eradication.

The authors are with the Technical Development Laboratories of the Communicable Disease Center, Public Health Service, in Savannah, Ga. Mr. Mathis is a medical entomologist, Dr. Fay is assistant chief, and Dr. Schoof is chief of the Biology Section. Mr. Quarterman is chief of the laboratories. (Manuscript received for publication March 23, 1959.) That certain toxicants, such as lindane, DDVP, Diazinon, and malathion, possess fumigant properties is an established fact. Moreover, in recent studies of the effectiveness against *Anopheles quadrimaculatus* of malathion deposits on walls, it was noted that 75 to 100 percent of the mosquitoes remaining in the entrance cages attached to the outside of the animal-baited huts were killed (1).

The death of these mosquitoes was presumed to result from malathion vapor being carried to the entrance cages from the interior of the huts by air currents. The magnitude of the fumigant action of organophosphorus compounds against mosquitoes was first detected accidentally through the unexpected mortality of mosquitoes in use as "check" insects in laboratory tests. Apparently, they were killed by fumes from an unopened bag of fly bait containing malathion and DDVP. To confirm this premise, two cages of A. quadrimaculatus were placed 1.5 and 3.5 feet above floor level in a small room (5 by 9 by 10 feet) at sites approximately 7 to 10 feet from the same unopened bag of bait located at floor level in an adjoining room (10 by 14 by 10 feet). The rooms were unoccupied and closed to the exterior, and the connecting door remained open. All specimens died within 2.5 hours. The fact that the unopened bag contained a plastic liner emphasized the mobility of the vapor.

To evaluate this fumigant action under less favorable conditions, the tests described below were conducted in an unoccupied two-room house and in two small huts.

House Test

Each room was 13 by 12 by 8 feet. One contained an exterior door and a window, and the other, two windows. All these and an interior door between the rooms were fully open. Cages of both susceptible Aedes aegypti (400 adults) and Musca domestica (200 adults) were placed in five positions in the two rooms as follows: room I-A, sheltered corner; room I-B, in open window; room I-C, above interconnecting door; room II-D, exposed corner; and room II-E, sheltered corner.

Four 5-pound bags of fly bait composed of 2.0 percent malathion and 0.5 percent DDVP were placed in room I on the floor, 5 to 8 feet from cage sites A, B, and C, and 13 and 17 feet respectively from sites D and E. The bait containers were double-paper bags lined with plastic. One was opened, and the others remained sealed. All specimens were exposed for 1 hour, during which time a gentle breeze (estimated 10 m.p.h.) passed through both rooms. After 24 hours, mortality for female houseflies was 21 to 24 percent at cage sites A, B, and C, and 2 and 0 percent at sites D and E. For female mosquitoes, the values were 95 to 99 percent at sites A, B, and C, and 64 and 52 percent at sites D and E.

Hut Tests

Each hut (8 by 8 by 8 feet) had 2 windows (3 by 3 feet) on opposite sides, both of which remained open during the entire experiment. In hut I, a single 5-pound open bag of bait containing 2 percent malathion and 0.5 percent DDVP was placed in the center of the floor; in hut II, three open 5-pound bags of the same bait were located one each at the apexes of a triangle (2 ft.) near the center of the floor. One hundred female A. quadrimaculatus were released in each hut at 3 p.m. 1 week after the baits were installed, and at weekly intervals during the next 3 weeks. The morning following each release, all specimens, both living and

dead, were collected and held for 24- and 48hour mortality determinations. Results showed 100 percent mortality for each of the four weekly tests in each hut. The tests were discontinued after the fourth week.

During the fourth week, caged specimens (25 females per cage) were exposed for the same time interval at floor level, and at 2, 4, and 6 feet above the floor. In hut I, all specimens at floor level and at 2 feet were dead within 48 hours. At the 4- and 6-foot levels, 44 and 88 percent respectively were killed. In hut II, mortality was 100 percent for all positions. However, mortality at floor level in an untreated check hut was also relatively high (24 percent).

Subsequent tests were made to determine whether malathion or DDVP, or the combination of the toxicants, was responsible for the residual toxicity. Separate formulations of 2 percent malathion plus 0.5 percent DDVP, of 0.5 percent DDVP, and of 2.0 percent malathion were prepared in a granular inorganic material (A). A 5-pound lot of each formulation was bagged in a paper container, and the bag was left open and placed in the center of the hut floor. Both "free-flying" and caged A. quadrimaculatus were introduced into each hut at 3 p.m., 3 hours after the bait was installed.

The following morning all mosquitoes, whether "free-flying" or caged, were dead. With the combination of malathion and DDVP and with DDVP alone, all the specimens were knocked down 3.5 hours after exposure began. With malathion alone, only a few specimens were down after 4.5 hours of exposure.

Tests on the residual potency of these formulations were precluded because of the onset of cold weather.

Discussion

The potential of residual fumigants for controlling house-frequenting adult mosquitoes, although obviously successful in producing a high mortality for 4 weeks, has not been explored fully in these preliminary tests. Further studies under laboratory and field conditions are now in progress to determine which toxicant or combination of toxicants is most effective, the

duration of residual action under various environmental conditions, efficient methods of formulation in small, lightweight units, and the toxicological hazards. The possibility of toxicological hazards to the occupants of treated dwellings represents a principal question concerning the practical use of the fumigants. This aspect will require extensive study before the technique can be put into general practice.

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If the use of residual fumigants proves feasible, it is readily foreseeable that this technique could result in important monetary savings by simplifying malaria eradication operations. Manpower requirements would be reduced drastically; the need for spraying equipment, with its attendant burdens of maintenance, as well as problems currently encountered with wettable-powder formulations, would be minimized; and other difficulties associated with residual spraying, such as the sorption of residues by certain mud surfaces, objections to the unsightliness of residues on some walls, and the modifications of treated surfaces by replastering, washing, and the like,

would be eliminated. Although mosquitoes appear more susceptible to fumigant action than houseflies, the technique may be effective also against other types of house-frequenting insect vectors and pests.

Because of the many potential advantages which the residual fumigant technique may offer in malaria eradication and in the control of other mosquito-borne diseases, it is hoped that the encouraging results of these preliminary tests will stimulate other workers to investigate the many questions which must be answered before the technique may be adopted for general use.

REFERENCE

 Mathis, W., and Schoof, H. F.: Organophosphorus compounds as residual treatments for adult mosquito control. Am. J. Trop. Med. 8:1-4, January 1959.

EQUIPMENT REFERENCE

(A) Perlite, Tennessee Products and Chemicals Corp., Nashville, Tenn.

Alaskan Research Advisory Committee

An Interagency Research Advisory Committee has been formed by representatives of the Alaska Department of Health, the U.S. Air Force Arctic Aeromedical Laboratory, and the Public Health Service's Alaska Native Health Service and Arctic Health Research Center. Its purpose is to assist scientific investigators in medical and allied fields who wish to perform research in Alaska.

The committee is prepared to aid investigators sponsored by a recognized institution by explaining local situations, helping solve logistic difficulties, and making available Alaskan facilities.

Persons desiring such assistance should write to E. M. Scott, Chairman, Interagency Research Advisory Committee, Arctic Health Research Center, Box 960, Anchorage, Alaska.

Live Attenuated Poliomyelitis Vaccine

For many years, the possible use of a live attenuated poliomyelitis vaccine, that is, a virus which has been grown in animals or eggs until it has lost its disease-producing potential without losing its immunizing ability, has been discussed. For more than 7 years, the problem has been under serious investigation.

The Salk vaccine, now in use and giving good results in protecting against paralytic poliomyelitis, is made from killed virus.

The main advantages visualized for a vaccine made from live attenuated virus are: (a) longer lasting immunity—although the Salk vaccine is believed to provide protection for some time, the actual duration of immunity is not yet known because it has been in use for such a short time; (b) ease of administration, with the live virus given orally instead of by injection; and (c) presumably lower costs of production.

At the present time three sets of strains are under investigation. These are most readily identified by the names of their developers, the Sabin, Lederle, and Koprowski strains, named respectively for Dr. Albert Sabin of the University of Cincinnati, Lederle Laboratories, and Dr. Hilary Koprowski of Wistar Institute of Philadelphia. The name of Dr. Herald Cox, of the Lederle Laboratories, is also associated with the Lederle strains.

Each set consists of three type strains. These sets of strains have now been administered to large numbers of persons in an attempt to determine: (a) their ability to produce adequate and durable levels of antibody, and (b) their safety in general use.

No untoward results have been

reported in relation to these studies. Stated in this way, the facts appear impressive. It must be remembered, however, that the data these studies were designed to collect have not yet been fully assembled, analyzed, or made public.

The Public Health Service is following these developments closely. Our Division of Biologics Standards of the National Institutes of Health, for example, is conducting laboratory investigations aimed at characterizing the type strains. These investigations are of importance because the Service may be asked some day to license the products.

I also have appointed an ad hoc committee composed of outstanding experts in this field to keep me advised of developments with respect to live attenuated poliomyelitis vaccines. This committee consists of Dr. Roderick Murray, chairman, director of the Division of Biologics Standards, National Institutes of Health; Dr. David Bodian, Johns Hopkins University; Dr. William McD. Hammon, University of Pittsburgh School of Public Health; Dr. Alexander Langmuir, Public Health Service, Communicable Disease Center, Atlanta, Ga.; Dr. Joseph Melnick, Baylor University, and Dr. John R. Paul, Yale University Medical School.

This committee has met twice and considered all information now available on these vaccines. The committee finds a number of important issues remain to be answered or resolved before the live attenuated poliomyelitis vaccines can be considered other than in the experimental stage.

These issues cover such points as: apparent differences in the ability of the different strains to invade the nervous systems of experimental animals; transmission of virus from vaccinated persons to others; feasibility of feeding the three type strains simultaneously; effect of viruses in the intestinal tract, other than polioviruses, on the development of immunity to poliomyelitis; validity of surveillance of populations inoculated to date.

The committee has felt some concern because some of the trials of live attenuated poliomyelitis vaccine have not followed the recommendations of the World Health Organization Expert Committee on Poliomyelitis. It also has been concerned by apparent differences in the virulence for the nervous system of some of the virus strains being used. This aspect of the problem needs further study.

The experience thus far indicates that encouragement should be given to carefully conducted, small-scale studies designed in such a way that the laboratory and epidemiological surveillance could produce results upon which a judgment could be made.

Large-scale trials of live attenuated poliomyelitis vaccine in the United States are considered unproductive because so large a proportion of the population already has been immunized with killed vaccine.

The decision to permit such trials in other nations is, of course, one for their health and medical authorities. However, because the experimental vaccines are made in the United States and because our ad hoc committee has been studying reports on them, I feel that such information as we have should be made public so that not only our people but the peoples of other nations can have all current available information as exists on which to form their opinions and base their decisions.

Homemaker Service in New Jersey

MARIAN R. STANFORD, M.D.

COMMUNITY homemaker service in New Jersey is a locally sponsored nonprofit activity to place women workers in households in which they are needed because of illness or disability or other family emergency. The placement of the worker is made by the local agency after evaluation of the home situation. The hours of service vary according to the family's need. Payment for the service is an obligation of the family or of a community agency if the family cannot afford to pay.

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Homemakers are mature women selected for their personality, dependability, good health, and special interest in working with families in which there is a family crisis. After screening and acceptance by a local committee, they take a standardized 19-hour training course. who complete the course satisfactorily receive a certificate. The course is sponsored and financed by the New Jersey State Department of Health's division of chronic illness control and administered through the extension division of Rutgers, the State University. Upon acceptance for service by the agency, the homemakers are given physical examinations, including chest X-rays and blood tests. They receive cards indicating they are in good health and they wear standard uniforms. While employed, they are covered by workmen's compensation, public liability insurance, and social security. This is arranged by the sponsoring agency.

What Homemakers Do

Homemakers do light housekeeping. They are not expected to do a huge family wash nor the spring or fall housecleaning. Nor are they a new category of domestics to do cleaning.

Fundamentally, their task is to assist the members of the family in maintaining a smoothly running household. They may set the house in order by straightening up, dusting, washing the dishes, and keeping the patient's room clean and fresh. They may plan or actually do the marketing, depending on the availability of other personnel in the family. They may prepare meals for the family, including lunches for the children and the breadwinner. They also prepare meals for the patient with due regard to the instructions of the physician. (Some orientation to the special dietary needs of sick persons is given in the preliminary training course which is a prerequisite to employment.) Homemakers provide essential care for young children and encourage well members of the family to carry their share of responsibility.

Homemakers are specifically advised that they are not to do bedside nursing or other nursing duties. Thus they complement rather than substitute for or compete with a community visiting nurse or practical nurse service.

The homemaker develops on the job. She is periodically supervised on the job. She is required to report on each case and confer frequently with her supervisor. These reports and conferences provide evidence of her competence, her reaction to illness and family situations and to the work she is performing. She aids the agency in evaluating the needs of the family and the length of service required. Her observations often are helpful to the supervisor and the physician; physicians and families volunteer

Dr. Stanford is director of the division of chronic illness control, New Jersey State Department of Health, Trenton.

information to the agency about the homemaker's competence and performance.

Effects of the Service

Community homemaker service helps to prevent a breakdown in the orderly management of the household because of illness or other family emergency. It prevents inadequate supervision of children; poor family nutrition; disproportionate burdens on some members of the household which could produce fatigue, worry, anxiety, resentment, and hostility; loss of efficiency; absence from work of employed members of the household; and absence from school of older children. Physicians say the service has prevented temporary breakup of the household, removal of sick persons from familiar surroundings to institutions, and placement of children with relatives or in foster homes.

From the standpoint of the community, the homemaker service may free more hospital beds for the acutely ill, may decrease demand for custodial facilities, and may eliminate the cost of avoidable institutional care.

History of Development

The promotion of community homemaker service in New Jersey is an outgrowth of the State health department's interpretation of its responsibilities under the Prevention of Chronic Illness Act of 1952 (chapter 102, Public Laws of 1952). This State legislation established within the department a division of chronic illness control. The division was directed to assume responsibility for activities directed toward the prevention, early detection, and control of chronic illness and the rehabilitation of the chronically ill.

Section 26: 1A-97-b of the Prevention of Chronic Illness Act provides that the division shall "plan for the provision of adequate visiting nurse and housekeeping aid services by appropriate public or private agencies throughout the State, to the end that the nursing and medical care being furnished to the chronic sick in their own homes shall be improved in every manner possible."

It is not the function of the New Jersey State Department of Health to provide direct services to the consumer; its function is to strengthen the community's capacity to provide such services. The division's effort helps to stimulate the development of community supportive services; the division does not directly provide that service through its own staff and personnel.

Prior to the creation of the State Consultant Committee on Community Homemaker Service, there were three homemaker services operating in New Jersey, two of them of the traditional type. These two were attached to family service agencies and provided help on a full-time basis to distressed families on the rolls of the agency, using an average of two homemakers in each agency.

In 1950, the third homemaker service, specifically planned to meet the needs of long-term patients, was started in Essex County under the sponsorship of the Essex County Medical Society. The primary objective was to lessen the emotional and financial toll of long-term illness by making it possible to care for the patient in his own home. Service was provided initially to the chronically ill. Later, homemaker service was provided to some persons with short-term illness, especially when it seemed likely that such help might prevent the illness from being prolonged.

The Essex County service served as a pattern for additional agencies. Recruiting home-makers from middle-aged and older women constituted a new approach. It provided satisfying work to a group which was otherwise finding it difficult to obtain employment in the labor market. The limited time basis on which the service is given, usually 2 to 6 hours per day, makes it particularly suitable for some women who might not feel physically capable of full-time employment.

In 1953, Dr. Daniel Bergsma, State commissioner of health, appointed the State Consultant Committee on Community Homemaker Service to promote the development of community homemaker services throughout the State. He asked the committee to develop a plan for community homemaker service specific enough to be used as a practical guide to interested communities but flexible enough to be adaptable to local conditions. He also asked it to develop a

Homemaker Films

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"Home Again" was prepared for the New Jersey State Department of Health and the American Heart Association. It may be purchased from the Mental Health Film Board, Service Department, 267 West 25th Street, New York 1, N.Y. The price is \$145. Copies of the filmstrip "Enter Hope" are unavailable for distribution outside of New Jersey.

course of study to help women who seek such employment to become suitable homemakers. Members of this committee have included physicians, lawyers, nurses, nutritionists, social workers, teachers, persons trained in informational techniques, and persons with considerable experience in organizational work. The first chairman, who served for 4 years, was a member of the Temporary Committee on the Chronic Sick appointed by the Governor to study needs and recommend legislation. This committee drafted the Prevention of Chronic Illness Act.

The State consultant committee, which originally had 10 members, now has 40. The committee has subcommittees working on such areas of activity as intake criteria, procedures, resources, fees, insurance, publicity, and financial support. The department maintains membership with the National Committee on Homemaker Service.

A handbook, which presented a plan for community homemaker service, was one of the first projects and was published by the State department of health. It has received wide circulation. Another pamphlet is entitled "A Training Course in Homemaker Service." Shorter, descriptive, promotional brochures were also developed for distribution among potential users of the services.

A statewide institute and, subsequently, regional institutes on homemaker service acquainted community leaders with the service and how it operates.

As a result of conferences between the division of chronic illness control, its consultant committee, and officials of the New Jersey State Department of Banking and Insurance, a special category of "homemaker" was set up by

the banking and insurance department, enabling insurance carriers to charge an equitable rate which is adjusted each year on the basis of claims.

The division of chronic illness control and its consultant committee explored with the New Jersey State Department of Labor and Industry the status of the volunteer agency under employment laws in the event a small fee for administration was added to the hourly rate paid to the homemaker herself. (The hourly rate to the homemaker is usually \$1.25.) The New Jersey State Department of Labor and Industry concluded that the community homemaker service, as a voluntary nonprofit group, was exempt from regulations which apply to commercial employment agencies, provided the agency files the proper exemption forms.

Promotional Aids

Promotional aids, in addition to printed material, include a color filmstrip with sound recording and a 30-minute film. The filmstrip, entitled "Enter Hope," is a true story in pictures of community homemaker services in New Jersey. It shows the training homemakers receive, the kinds of service they give, and the benefits that accrue to the patient, the aged person, and the family group.

The film "Home Again" reveals the valiant efforts of a father to keep his family together when the mother is in the hospital because of a heart attack. For the first time in an American film, the role of the homemaker service is dramatized. The film also demonstrates how homemaker service by a supervised team approach can keep a family together in time of crisis and how it can help relieve emotional tensions and stresses and strains that impede recovery of the chronically ill.

Members of the State consultant committee, through their widespread and influential contacts, have inspired and helped to arrange local meetings on community homemaker service, and have spoken at many of them. The division of chronic illness control of the State department of health has fostered the program by underwriting the cost of the homemaker training course administered by Rutgers University. The division provides temporary grants-in-aid

National Homemaker Conference

About 300 persons attended the National Conference on Homemaker Services held February 10-11, 1959, in Chicago.

The conference was called to encourage development of programs to help families maintain themselves at home when illness or other major crises occur. Sponsored by 26 national voluntary agencies and 8 units of the Department of Health, Education, and Welfare, it was described as the most representative conference on homemaker services ever held in this country. About one-half of the participants had attended preconference study groups in New York City, Chicago, San Francisco, Cleveland, Raleigh, Denver, and Trenton.

The concept that homemaker services should be available to any family or individual on the basis of need, regardless of income or age, was set forth.

Agreement was reached that if homemaker services are to be extended nationwide, a partnership of agencies at Federal, State, and local levels is required.

Dr. David E. Price, chief, Bureau of State Services, and Assistant Surgeon General of the Public Health Service, in an address on the health-welfare partnership, said, "The mutual interest of the health

and welfare professions in extending homemaker services affords a good illustration of how closely health change and social change bind us in an inextricable partnership. The longer lifespan, a health gain, has given us an older population with consequent increase in chronic ills. These long-term disabilities in turn bring economic and emotional problems which can lead to more physical illness. Smaller families, working wives, and the change to an urban, apartment civilization—a social change—often give us no one to care for the bedridden and homebound. And so it goes, round and round, health-welfare, welfare-health. In the middle stands the homemaker, a personification of our partnership."

Dr. Price summarized, "I have noted a growing trend in health departments toward a research approach to public health practice. We are encouraging this in every way possible. At the State and local level, fresh ways of meeting health needs are being sought, trying to fit methods to people, rather than forcing people into rigid patterns of established procedure. In such a search, homemaker services should prove of interest to many."

in some instances to enable community homemaker services to acquire either part-time or full-time directors to strengthen supervision of the service in the home or to demonstrate countywide coverage and underwrites the cost of educational materials, training aids, and State conferences.

The training course for homemakers, given in various municipalities to make it more convenient for women to attend, includes consideration of these topics: what homemaker service is; working with people; homemaker and family relationships; accident prevention and safety in the home; family life in relation to food and home care; understanding children, the elderly, and mental illness; understanding what occupational therapy is; and agency procedures.

There are now 12 established homemaker services in New Jersey, and more than 600 women have been trained as homemakers since June 1954. Most of the services are working toward a county service. Activity in four other counties gives promise of favorable development. From a population standpoint, more than half of the residents of New Jersey now have established homemaker services available to them. Geographically, more than one-third of the State is thus served. One objective of the health department and of its State consultant committee is to have such a service available to all families in New Jersey who need it.

LITTER and the Public Health

HOMER N. CALVER, B.S.

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THE FIRST street cleaning department in America was established in Philadelphia in 1750 by Benjamin Franklin, according to the American Public Health Association. Some 200 years later, in 1953, Keep America Beautiful was incorporated in New York City; it is the first national organization specifically set up to combat litter.

The growing litter menace had for some time been the concern of many kinds of national and local, official and voluntary organizations. Several of them were already valiantly fighting uncoordinated uphill battles to clean up our highways, streets, streams, parks, lakes, and beaches. These individual efforts brought temporary improvement here and there, but Keep America Beautiful undertook to wage continuous warfare on a national scale, emphasizing a new concept: the concept of prevention. This approach to the problem was designed to reduce the litter and therefore the enormous cost of cleanup and collection. It may be expected to produce more lasting results.

against soil and water pollution. Early public health programs against indiscriminate pollution of soil and water with body wastes first emphasized the need for collection of these wastes (privies). Later, public health workers became concerned with transportation (sewerage). Refuse disposal was in general tackled in reverse order. Only lately have their efforts focused on the problem of getting the refuse properly accumulated in the first place. Litter might be defined as unaccumulated refuse, so the campaign against litter is in effect a campaign for the accumulation of rubbish at central points from which it may be more economically collected for transportation and disposal.

When environments are untidy, the health

The campaign against litter is a campaign

When environments are untidy, the health department is usually blamed, even though policing the environment may not be its responsibility. Every health department must therefore concern itself with the prevention of litter if for no other reason than to win public support for its whole program. In addition, however, public health workers have a direct stake in litter prevention as a way of reducing disease and accidents.

Rubbish promotes the breeding of rats, flies, and mosquitoes. It causes accidents, particu-

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larly on highways. Cars swerve to avoid rubbish. Tires are cut, causing blowouts. Paper blows against windshields, obscuring vision at a critical moment. Reflections at night from a piece of glass or metal may be confused with the reflection from a traffic marker or mistaken for the eye of an animal. In the Milwaukee Journal of December 8, 1957, the Associated Press reported an estimate of 750 to 1,000 persons killed and 100,000 injured each year as a result of striking or swerving to avoid objects on highways. Refuse on beaches, in lakes and streams, in swimming pools, and in parks and playgrounds can cause cuts and abrasions which sometimes result in serious infections, and refuse on sidewalks and steps causes falls. Uncollected rubbish is the source of many fires, some of which cause injury and death. Litter in a lake or river can puncture the hull of a boat traveling at high speed, or damage a rudder or propeller. Such accidents can be the precursor of death.

There are also other attributes of litter. Dr. Justin M. Andrews, at the third annual conference of the Keep America Beautiful Advisory Committee in New York City in 1956, pointed out that "litter is frequently the surface symptom of a diseased environment." When the sanitarian sees this symptom he must be as concerned about seeking and removing the cause as the physician is about seeking the cause of a rash on the body. Here one might ask, what is the cause of litter? Is there an epidemiology of litter?

Without doubt, one cause of litter is mass production which makes it cheaper to discard and replace than to repair or re-use many things. Other causes are modern sanitary packaging, increased leisure time, increased mobility, and a food supply so abundant that we can waste much food. It is a wry thought that many of the attributes of a higher level of consumption are the very things which are impairing our health and the esthetic quality of our environment.

But there are additional causes. Some of the obvious ones are the lack of adequate trash receptacles at convenient points and infrequent and careless collections. But perhaps there are deeper causes as well. There would seem to be

some evidence that littering is communicable. For example, a beach, park, or highway which is already littered invites more litter. If some members of a family are in the habit of littering, other members of the same family are likely to have the same habits. There is more litter in some communities than in others. There are probably social, economic, regional, sex, and age factors related to litter production, just as there are surely seasonal variations in the amount of litter produced. These variables need to be identified. Pin maps showing pounds or bushels of litter per capita by areas might be illuminating in a study of the epidemiology of litter.

It is not sufficient to assume that general programs of education, publicity, and propaganda, or appeals to pride and pocketbook, or stricter laws better enforced will prevent litter over the long run. With litter, as with any other public health hazard, we cannot plan and focus programs of prevention until we have more information than we have now as to its causative factors.

The public health profession is uniquely equipped to solve some of the basic questions. Meantime it will have to deal with the problem of litter by empirical methods of law enforcement and education, just as it had to deal with yellow fever, cholera, and typhoid fever before the causes and routes of infection of these diseases were known. In this case, however, it is doubtful that an anti-litter serum can be developed or that if it were developed it would be used by the family physician.

Although the challenge is formidable, empirical methods are already producing remarkable results in many localities.

Philadelphia

In Philadelphia, for example, the junior sanitation unit has given new life to the Philadelphia Clean-Up Committee. The committee's block organization plan had met with little success until the boys and girls were formed into units in the schools by the city's police sanitation officers. Each member pledges to keep himself clean at all times and to aid in keeping his home, school grounds, and neigh-



New York Times photograph

Litter and rubbish in a 20-by-100-foot lot in Brooklyn presented not only an eyesore but a fire and safety hazard to the neighborhood.

borhood neat and litter free. Saturday mornings as their neighbors watch, the junior sanitation "cleaner-uppers"—who are easily identified by their white caps lettered "clean up"—work with verve and pride. Their contribution is not only material but inspirational as it stirs parents and neighbors to join in the crusade.

Today, Philadelphia has more than 975 organized blocks where flowers bloom in door-yard and backyard gardens, in porch boxes and fence boxes, and even in sidewalk boxes—concrete troughs set against the houses and planted with climbing roses to brighten the once shabby streets. Block captains, a new aristocracy of citizens, work seriously, diligently, and enthusiastically with their groups, sparked with the contagious zeal of youth. The junior sanitation unit will also prove to be a reservoir of future leadership in the anti-litter movement.

Savannah

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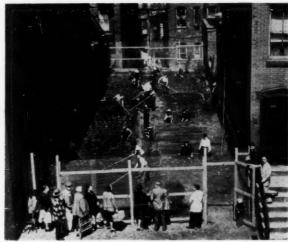
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Savannah, Ga., started with a women's committee; a caricature of "Pelican Pete," a bird indigenous to the Georgian coast that could be used as a symbol to speak for the committee; and 30,000 litterbags which had been donated by a paper corporation. The slogan was Keep Beautiful Savannah Clean.

The litterbags created enough interest so that when trash receptacles in which to place them



New York Times photograph

The lot became a garden of flowers, shrubs, and vegetables, with a 10-foot maple tree, after transformation by school children.

after use were needed, individuals and business firms contributed them willingly. Window stickers of Pelican Pete were distributed, and 10,000 automobile stickers were given out by gas stations and banks. Silver cups were awarded to schools where the grounds were improved. So dedicated were boys and girls in the cleanup movement that mothers who became anti-litter committee members testified at meetings that no longer would they dare to throw trash from car windows lest they incur junior's censure.

Enlisting aid from all sources—civic, service, and fraternal organizations, and business and industry—the committee also appeared before the city council, county commissioners, police department, and health and sanitation department to ask their cooperation. Their efforts have brought about ordinance changes as well as all-out support of the community's continuing anti-litter program.

Indianapolis

"Yard Parks," Indianapolis' title for the year-round litter control program, is structured in special divisions with a "trouble-shooter" for each to investigate public complaints and take proper action. The divisions, such as allied florists, drug stores, and public health, make Yard Parks an integral part of all community activities, enlisting the support of every citizen

through his work, organization membership, or hobbies.

Litter prevention is being taught as the "yards beautiful" course in all public, parochial, and private schools in the city and county with full support of the educational phase by community groups and PTA units.

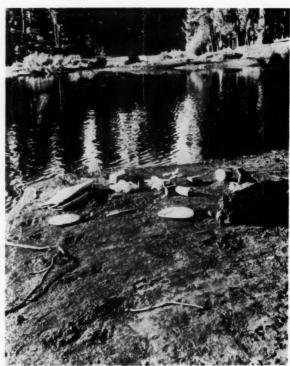
San Antonio

San Antonio, Tex., long famed throughout the country for its palm-lined avenues of lovely homes and artistically landscaped parks, deteriorated during World War II into a ghost of its former beauty. Littered streets, rundown houses with unkempt lawns, weed-grown lots, and neglected parks where plants and shrubs had been allowed to die had changed the face of the city.

Littering had become communicable. Lack of civic pride and indifference were deeply entrenched in the public consciousness. No civic group came forward. One man, O. P. Schnabel, spearheaded the movement to check littering. With very little support he called on the newspapers, radio, and television stations to arouse the citizenry. Some financial help came from business firms aware of the potential value of a clean city.

Throughout San Antonio were heaps of accumulated household trash. As no regular trash removal was made by the city, Mr. Schnabel and his committee initiated an annual trash haul. Private firms donated a truck and helpers, and in the first year, 1949, thousands of tons of trash were removed from homes and yards. These annual hauls not only saved citizens a million dollars in private trash-toting fees, but awakened them to the realization that their town was depreciating. More residents joined the campaign, and in 1951 San Antonio won its first National Cleanest Town Award in a contest sponsored by the National Clean Up, Paint Up, Fix Up Bureau in Washington, D.C. Since then, San Antonio has won an award every year, receiving the National Grand Award in 1954.

Today there is a Beautify San Antonio Association which cooperates with the chamber of commerce and other public and civic organiza-



Dunsmuir News photograph

Littered shoreline blights a beauty spot along California's McCloud River. Thousands of youth and adult groups have joined the movement to enhance and preserve the Nation's scenic beauty.

tions. More than 750 trash cans have been placed at strategic locations to encourage citizens to keep streets and parks clean. Elementary and high school students have conducted essay and poster contests and devised school checklists which have resulted in cleaner school grounds. Homes have been beautified through pressure exerted by children upon their parents. The city health department regularly notifies owners of unkempt lots. If the owners fail to respond, the department cleans up the debris and bills them for the cost.

As a long-range plan for making America litter free, officials of the Beautify San Antonio program advocate that future automobiles should have built-in trash receptacles. They believe that 90 percent of Americans will cooperate if they have a place to deposit litter while driving. Meantime, they are encouraging the use of disposable litterbags and other portable containers.

Four-Point Formula

These four cities are not unique. Each became aware that it was faced with a problem, and met the situation as it best suited the individuality and resources of the community. These and other cities, currently dedicated to the fight against litter, are finding effective the four-point formula for litter prevention of Keep America Beautiful. It includes:

 Public education to cultivate individual responsibility, civic pride, and good citizenship habits.

 Participation in public interest projects for cleaner, more attractive surroundings.

· Adequate collection and disposal facilities.

· Adoption and proper enforcement of State

and local legislation to penalize willful offenders.

There is no magic formula for any city; but the plan most likely to succeed is a full-time, continuous program of litter control supported by all the interested groups in the community, with the full cooperation and participation of government.

If communities throughout the country join the effort, perhaps in succeeding generations the "inherited" tendency toward the disease of litter will be markedly reduced.

Project guides for leaders on various phases of litter prevention are available from Keep America Beautiful, Inc., 99 Park Avenue, New York 16, N.Y.



Rabies

Although only six cases of rabies in man were reported in 1958, it is worth noting that half of them were traced to bites by animals other than dogs. One case each was traced to a bite by a skunk, a fox, and a bat. This is a slightly higher proportion of infections from wildlife sources than for the previous 5 years. The relatively lesser importance of dogs in the etiology of infection in man parallels the decline in number of rabid dogs reported and an increasing number of rabies infections reported in wild animals. About 1940, 85 percent of all cases of animal rabies reported were in dogs and about 3 percent in wild animals. Since that time, cases of rabies in dogs have declined nearly 65 percent, while in wild animals there has been almost a tenfold increase in numbers reported.

The measures for control of rabies in dogs are well established; vaccination and elimination of stray dogs. On the other hand, the complex problem of controlling infection in wild animals continues to be formidable. The apparently increasing amount of rabies in wildlife is a threat not only to the health of man but also to domestic animals. The annual economic loss in cattle and horses infected with rabies by wild animals is considerable.

The extent of the task of preventing rabies in man cannot be measured by the small number of deaths. Any calculations must include the approximately 60,000 persons who receive injections of vaccine annually because of exposure to rabid animals or to animals suspected of having rabies. Investigations have been underway to develop vaccines that will not induce serious reactions but will stimulate adequate antibody responses. The optimum use of hyperimmune serum is being studied, and the development of a gamma globulin is regarded as a possibility. Pre-exposure vaccination is being considered for certain individuals, such as veterinarians and mailmen who often have contact with biting dogs .-DR. CARL C. DAUER, medical adviser, National Office of Vital Statistics, Public Health Service.

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Total serum cholesterol values obtained from a sample of American Indians on five reservations are significantly lower than those from a Cleveland clinic population.

Serum Cholesterol Levels in American Indians

SIDNEY ABRAHAM and DAVID C. MILLER, M.D.

AN OPPORTUNITY to examine the level of total serum cholesterol of Indians residing on five reservations in the United States was afforded when the Public Health Service, in cooperation with the U.S. Department of Interior, conducted the Indian Health Survey from October 1955 through June 1956.

Such an examination is of epidemiological interest, since an early study reported infrequent coronary heart disease among the Navajos which prompted an examination by subsequent investigators (1, 2). They found in a small sample of hospitalized Navajos a low serum cholesterol level when compared with that of a clinic group from the Cleveland population, although the Navajo dietary fat intake apparently was not much less than that of the general diet. These findings are contrary to still inconclusive evidence that a high fat intake is reflected in a high concentration of serum cholesterol in the blood and, perhaps, in an increased tendency to develop atherosclerosis (3, 4). It was theorized from these findings that

genetic factors, rather than dietary factors, were the principal cause of the low serum cholesterol level and low coronary heart disease occurrence among the Navajos. Other investigators, in studying different groups of the Navajo population, were not impressed that the Navajo mean serum cholesterol level was particularly low. They concluded that the mean level which they observed does not support the hypothesis that the low prevalence of coronary heart disease among the Navajos is a result of low blood lipids (5).

It is of particular interest, therefore, to examine the serum cholesterol levels of the American Indians in this survey and to compare these with levels of an American white population having a high mean serum cholesterol level (2). The American Indians who were examined resided on the following reservations: Acoma, N. Mex.; Crow, Mont.; Lac Courte Oreilles, Wis.; San Carlos, Ariz.; and Yankton, S. Dak. The relationship with age was also examined and is presented as additional statistical evidence concerning the level of serum cholesterol of populations (6).

Population Studied

The Indian Health Survey was initiated at the request of the 84th Congress, 1st session. The purpose was to determine "the needs and measures necessary to bring Indian health to

Mr. Abraham is statistician, Heart Disease Control Program, Division of Special Health Services, Public Health Service. Dr. Miller, formerly associate chief, Operational Research Section, Heart Disease Control Program, is now medical officer in charge, Public Health Service Indian Hospital, Tuba City, Ariz. (Manuscript received for publication February 13, 1959.) an acceptable level." An interview was conducted with members of every household living on each of nine selected Indian reservations; usually only the adults present were interviewed. This aspect of the survey yielded estimates of the extent of illness and the extent of medical care and health facilities available. The results of these interviews are reported elsewhere (7).

Clinical examinations were conducted in selected households. The examination consisted of medical history, physical examination, and laboratory tests. The purpose was to obtain more specific information on the extent of illness and disease among Indians than was obtained by the household interview. A random sample of members of households on five of the original nine survey reservations was taken for this purpose. Household serial numbers assigned at the time of the initial house-to-house survey were used to select examinees.

Methods

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Total serum cholesterol was determined by the method of Abell and associates (8). Blood samples of adult Indians were collected and shipped to the National Heart Institute Laboratory at Framingham, Mass., for determination of serum cholesterol values. The Cleveland Clinic Foundation employed a similar method in obtaining total serum cholesterol values of the white population group used for comparison. Both the laboratories, Framingham and Cleveland, had previously established the reproducibility of their total serum cholesterol measurements (9).

State of Health

Levels were determined for clinically healthy Indians as well as for those who were found to have diseases or conditions that influence the serum cholesterol level. To conform with the practice of other reporting investigators, however, only those Indians are included here whose state of health was uncomplicated by conditions which might affect serum cholesterol. Women whose clinical records showed that they were pregnant were excluded.

Results

Table 1 summarizes the values of total serum cholesterol of clinically healthy Indian men and women residing on five Indian reservations. For men, the mean serum cholesterol levels range from a low of 193 mg. per 100 cc. for San Carlos Indians to a high of 224 mg. per 100 cc. for Crow Indians. For all reservations, Indian women show consistently lower mean serum cholesterol levels than Indian men. Women residing on the San Carlos Indian Reservation show the lowest mean serum cholesterol value,

Table 1. Serum cholesterol levels in American Indians on five reservations, by sex

	Number of	Serum chol	esterol (mg. 1	per 100 cc.)	Age		
Sex and reservation	persons	Mean	Standard deviation	Range	Mean	Standard deviation	
Male							
Crow	28	223.8	41.4	106-310	35.5	9.3	
Yankton	21	209.9	38.0	154-296	35.9	10.6	
Acoma	25	223.0	60.3	98-336	38.7	11.0	
San Carlos	21	193.5	28.5	143-255	36.4	13.0	
Lac Courte Oreilles	16	212.6	49.1	125-301	38.4	9.0	
Female							
Crow	26	200.2	45.3	137-345	34.8	9.3	
Yankton	15	209.1	56.5	137-335	31.0	9.5	
Acoma	40	191.7	36.0	154-262	34.8	12.3	
San Carlos	34	189.4	41.4	114-287	32.1	8.6	
Lac Courte Oreilles	32	199.9	45.1	92-273	38.1	9.6	

189 mg. per 100 cc. Women residing on the Yankton Reservation show the highest mean serum cholesterol value, 209 mg. per 100 cc.

Data were combined for each sex without regard to reservation because of the small numbers of serum cholesterol determinations done at each location. Pooling of data seemed justified because there were no significant differences in mean cholesterol among Indians on different reservations. [Males: F > 1.71 ($F_{.05} < 2.46$). Females: F > 0.77 ($F_{.05} < 2.44$).] Although this sample is homogeneous in regard to serum cholesterol, it is recognized that certain genetic and cultural differences exist between the different tribes. Mean cholesterol levels of Indians were compared with those obtained from the Cleveland Clinic Foundation which had been used for comparison with the level of serum cholesterol of a group of Navajos. The mean levels of the Cleveland group have been found to be in the same range as the levels for other population groups (9). Since the original clinic data were divided into two age groups (2), the American Indian serum cholesterol data were similarly divided, with the age means and standard deviations comparable for both groups.

Indian men and women show a significantly lower mean serum cholesterol than Cleveland men and women for the two age groups (table 2).

Table 3. Serum cholesterol level of selected American Indian males, by age

Age group, in	, Number		holesterol 100 cc.)
years	of males	Mean	Standard deviation
20-29	31	193. 5	29, 3
30-39 40-49	33 28	227.4 217.8	47. 2 51. 7
50-59	19	216. 4	45. 8

Further evidence of the level of serum cholesterol of a population involves knowledge of the relationship between age and cholesterol. Ample evidence exists that serum cholesterol levels are, in part, dependent on age. Populations with high serum cholesterol generally show a significant rise in serum cholesterol after the thirties, while populations with low serum cholesterol do not show such a rise during this period (6). On the other hand, there are significant increases in serum cholesterol with age in the younger age group to about the thirties in both low and high serum cholesterol populations.

In the low serum cholesterol populations, the mean serum cholesterol reached a plateau after the thirties in the Naples, Italy, area (6).

Table 2. Serum cholesterol levels by age of selected American Indians and a Cleveland white group

	American Indians						Cleveland white group ¹					
Sex and age group	Number	Serum ch (mg. per		A	ge	Number	Serum ch (mg. per		A	ge	Comparison (P)	
	persons	Mean	S.D.	Mean	S.D.	persons	Mean	S.D.	Mean	S.D.		
Male												
YoungOlder	64 47	211 217	$\frac{42.8}{49.5}$	29 47	6.1 5.5	58 99	230 242	$\frac{33.5}{29.9}$	27 45	$\frac{8.4}{9.0}$	$^{2}_{2} < .05_{2}$	
Female YoungOlder	105 42	192 206	$\frac{42.9}{42.5}$	29 47	6.0 4.7	42 55	216 230	58.4 44.5	26 43	$\frac{7.8}{7.5}$	² < .05	

1 Reference 2.

² Cochran and Cox approximate method used to test the hypothesis of equality of means with no hypothesis about the population variance: when $n_1 \neq n_2$ and $s_1 \neq s_2$. Snedecor, G. W., Statistical Methods, Ed. 4, Ames, Iowa, Iowa State College Press, 1946, p. 83.

S D .- Standard deviation,

Table 4. Statistical tests of the presence of significant age-cholesterol relationship and of departure from linearity of selected American Indian males

	F test				
Age group, in years	Linear trend	Departure from linearity			
20-39 40-59	1 10.49 .05	0.73 1.50			

¹ Significant at 1 percent level.

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From the early thirties to the fifties, the level of serum cholesterol in low-income working men of Madrid, Spain (10), tended to decline instead of rising so that the cholesterol levels at these ages were much lower than those of high serum cholesterol level populations.

In high serum cholesterol populations, such as middle-income men in Minnesota (11), professional men in Madrid (10), and Jewish and Italian workers in New York (12), serum cholesterol levels show a rise into the fifties. It should be noted, however, that the study of the age-cholesterol relationship in a high serum cholesterol population in New York did not determine significant age-cholesterol relationship beyond the thirties (13).

Table 3 shows the mean serum cholesterol level of Indian men by age. The mean serum cholesterol rises from ages 20 through 39 years, levels off, and remains fairly constant in the older ages. In order to test the significance of the age-cholesterol relationship, analysis of variance and regression analysis were made.

This age-cholesterol relationship analysis was made for age groups in which F tests indicated no significance of deviation from linearity. For Indian men, F tests of linearity of age-cholesterol relationship indicated two age groups, 20–39 years and 40–59 years. F tests also show that for Indian men there is a significant age-cholesterol relationship in the younger age group, 20–39 years. Significant age-cholesterol relationship is not evident in the older age group, 40–59 years. Statistical tests of the presence of significant age-cholesterol relationship and of the departure from linearity are presented in table 4.

Regression equations for two age groups showing the relationship between age and cholesterol are presented in table 5. For the younger age group there is a significant increase in total cholesterol level, averaging about 3 mg. per 100 cc. per year. In the older age group the average increase is less than one-half mg. per 100 cc. per year, which is not a significant increase.

Table 5 also shows that the predicted mean serum cholesterol value determined from the regression equation for males of ages 20–39 years with an average age of 29.2 years is 211 mg. per 100 cc. The corresponding predicted mean serum cholesterol value for males of age 40–59 years, with an average of 47.3 years, is 217 mg. per 100 cc.

Significant age-cholesterol relationship displayed in the younger age group of the American Indian series is similar to the serum cholesterol level pattern of change with age found in the younger age group of both low and high serum cholesterol populations. The fact that

Table 5. Age and serum cholesterol level relationship of selected American Indian males

Age group, in years Number		A	ge	Serur	Standard			
	Mean	Standard deviation	Mean	Standard deviation	a 1	b 1	error of slope	
20-39	64 47	29. 2 47. 3	6. 1 5. 5	210. 9 217. 1	39. 9 50. 0	133. 2 203. 4	+2. 66 +. 29	² 0. 82 ³ 1. 33

¹ The values for a and b are constants with regression equation: cholesterol=a+b (age). The average annual change of serum cholesterol concentration in mg. per 100 cc. is indicated by the regression coefficient b in the regression equation. X is equal to age in years; y is equal to serum cholesterol level.

² Slope significantly different from zero slope.

serum cholesterol does not continue to rise after age 39 years in the Indian group places this group in the same category as other low serum cholesterol populations which have been mentioned.

Discussion

This study attempted to determine whether level of serum cholesterol of clinically healthy Indians residing on five reservations in the United States is low or high in comparison with the levels usually accepted for general U.S. populations.

It was found that the level of serum cholesterol of this American Indian series was significantly lower than that of a sample group from the Cleveland clinic. This supports the findings of an earlier study, in which it was found that the level of serum cholesterol of a sample of hospitalized Navajos was signifi-

cantly lower than that of the Cleveland clinic group (2).

Data from this American Indian series are not available regarding the first and third variables of the interrelationship of fat content of diet to serum cholesterol level to atherosclerosis (and coronary heart disease). When three variables were examined in an earlier study, it was observed that because estimated Navajo dietary fat was not much less than that of the general American level, genetic rather than dietary factors might be largely responsible for low serum cholesterol and low coronary heart disease frequency (2).

Certain suggestive data are available regarding one genetic characteristic of this American Indian series. These data pertain to the quantum of Indian blood for each reservation and were obtained from interviews conducted during the health survey. There is some reason for overstatement of Indian ancestry because

Relation between quantum of Indian blood and mean serum cholesterol.

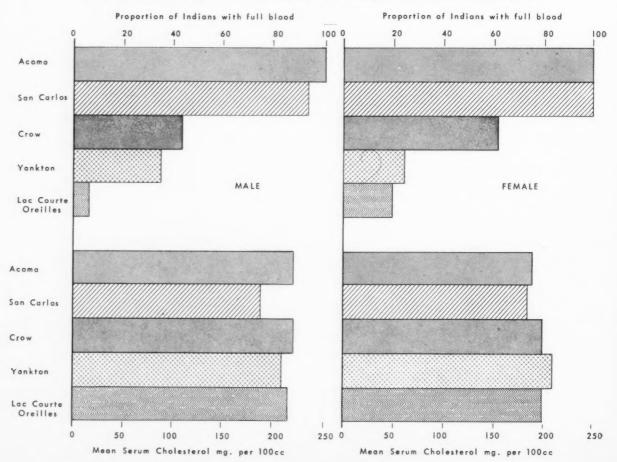


Table 6. Comparison of mean serum cholesterol levels between two blood groups of American Indians on five reservations

	Full blood					Less than full blood					
Sex Number of persons	Number Serum cholesterol (mg. per 100 cc.) Age		ge	Number	Serum cholesterol (mg. per 100 cc.)		Age		Comparison (P)		
	persons	Mean	S.D.	Mean	S.D.	persons	Mean	S.D.	Mean	S.D.	
MaleFemale	64 100	216. 5 191. 5	45. 8 36. 3	37. 4 33. 7	10. 4 9. 2	45 45	209. 8 202. 5	37. 7 48. 7	35. 8 36. 9	9. 7 8. 6	>. 05 1 >. 05

¹ See footnote 2, table 2.

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receipt of many benefits depends on having a minimum of one-fourth Indian blood (7). Enumerators in the survey were recruited from reservations, which may have tended to minimize overstatement of quantum of Indian blood.

If the genetic factor as measured by this subjective self-reporting of ancestry is operating to lower serum cholesterol in the Indian population, the reservations with larger proportions of full-blooded Indians should tend to have lower serum cholesterol levels. The chart shows that while there is great variation in proportion of Indians with full blood among the five reservations, there is no relationship between proportion of Indians with full blood and the mean serum cholesterol levels.

Another approach to analyzing the relationship of the quantum of Indian blood and serum cholesterol level was made by dividing the men and women into two groups, those with full blood and those with less than full blood. As indicated in table 6, these two groups, both men and women, have comparable mean ages and standard deviations. This approach confirms the previous analysis by indicating that there is no significant difference in mean serum cholesterol level between the two groups for each sex. It is apparent, however, that more objective measures of genetic characteristics would be necessary before any definite conclusions could be drawn regarding the relationship of genetic factors and serum cholesterol level.

As indicated previously, Darby and associates (5) studied two groups of Navajo In-

dians. One was centered about Ganado, a missionary center. This group consumed fat-rich foods much more frequently and had a mean serum cholesterol level which was significantly higher than the other group of Navajos studied at Pinon, an area located in the interior of the Navajo reservation. It would appear, therefore, that within an ethnically similar group there are considerable internal differences in diet and serum cholesterol patterns.

It must be recognized that various subgroups of Navajos may be ethnically dissimilar. Whether such blood lipid variations are, in turn, associated with differences in morbidity and mortality from coronary heart disease (as might be expected in view of the implication of hyperlipemia in the current popular working hypothesis of causation of coronary heart disease) suggests a fruitful area for epidemiological study of the Navajos, by far the largest American tribe of Indians and possibly the most primitive. Additional impetus to further study of the Navajos stems from another study which indicates that their death rate for cardiovascular diseases is significantly lower than that of all other American Indian tribes (14).

Summary

- 1. Total serum cholesterol determinations were obtained from five tribes of American Indians who were examined during the Indian Health Survey.
- 2. No statistically significant difference in their mean serum cholesterol levels was found among the different tribes, but the samples were

S.D.—standard deviation.

too small to conclude that clinically significant differences do not exist.

3. The serum cholesterol level of this American Indian series was significantly lower than that of the Cleveland clinic group, whose mean level is similar to that found in other surveys of American non-Indian populations.

4. The finding is in agreement with the results of a study which found that Navajo Indians have a significantly lower serum cholesterol level than that of a similar American clinic population.

5. The finding, in another study, of a higher serum cholesterol level among one subgroup of the Navajos and of a significantly lower mean level among another subgroup suggests important environmental factors at work among this ethnic group. The circumstance lends itself favorably to further epidemiological study of dietary patterns, blood lipid levels, and occurrence of coronary heart disease among the Navajos.

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Shellfish Sanitation Laboratory Moves

The Shellfish Sanitation Laboratory, Robert A. Taft Sanitary Engineering Center, has moved from Gulf Breeze, Fla., to Purdy, Wash. The new mailing address is: U.S. Department of Health, Education, and Welfare, Public Health Service, Shellfish Sanitation Laboratory, Star Route Box 576, Gig Harbor, Wash.

Forcible Detention of Patients With Active Tuberculosis

ROBERT GLASS, M.D.

L hospitalization of recalcitrant patients with communicable pulmonary tuberculosis apply in many States of the United States (1). Only a few States attempt enforcement, however, because most lack facilities suitable for isolation of recalcitrant patients. Programs for forcible isolation of recalcitrant patients suffering from active pulmonary tuberculosis are in effect in California, particularly Los Angeles County (2,3); Seattle, Wash. (4); Milwaukee, Wis. (5); Nova Scotia, Canada (6,7); Columbus, Ohio (8); Philadelphia, Pa. (9); and in the State of Georgia (10).

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Since 1903, New York City has had regulations governing and directing forced hospitalization of recalcitrant patients suffering from communicable diseases, including tuberculosis. From 1916 to 1942, the city used for this purpose a municipal hospital on an island in the East River, accessible only by ferry boat. A guard at the hospital gate sufficed to prevent illegal departures from the hospital, which could hold 60 to 100 patients at one time. After 1942, this hospital was diverted to other uses, and the detention of these patients was tried in two other municipal hospitals in succession.

The physical nature of these facilities, however, and the lack of correctional personnel were inadequate to prevent escapes.

In 1955, limited facilities for the detention of recalcitrant male patients suffering from communicable pulmonary tuberculosis were provided at the hospital of the Rikers Island Penitentiary for men, where the medical and administrative arrangements appeared to offer good prospects.

This report presents the results of the enforced hospitalization of 46 male patients successively admitted to Rikers Island Hospital in New York City from July 1, 1955, through December 31, 1957.

The New York City Program

Patients are admitted to the detention service as violators of the Sanitary Code of the City of New York, section 87, regulation 16; and section 97, regulations 3, 4, 5, and 6. These paragraphs empower the commissioner of health of New York City to remove to and detain in a hospital, patients suffering from pulmonary tuberculosis in a communicable form, who present, or are likely to present, a danger to the lives and health of other persons. These patients are known to the department of health as persons who have pulmonary tuberculosis with positive sputum or cavitary lesion and who willfully neglect to take precautions against transmission of the disease. Nonattend-

Dr. Glass is a clinician with the bureau of tuberculosis of the New York City Department of Health. The program referred to in this paper is carried out with the cooperation and assistance of the New York City Department of Correction.

ance at chest clinics, refusal to accept hospitalization, and irregular discharges from hospitals are frequent features in the records of these patients. Chronic alcoholism is also present in a comparatively high percentage of this group.

Forcible hospitalization on the detention service is undertaken only after physicians, nurses, and medical social workers, through concerted action, have exhausted by personal contact and by mail all possible means of soliciting the recalcitrant patient's voluntary cooperation (11).

As a premonitory measure, the "hold" procedure has been instituted. Patients who in the past have habitually left the hospital against advice, have not returned from permitted leave, or have disregarded hospital regulations are given the alternative of accepting voluntary hospitalization with strict adherence to hospital regulations, or removal to the detention service under the regulations of the sanitary code. Under the "hold" procedure the patient, as well as the administration of the hospital to which he is admitted, is informed that the patient is not to be given a pass without consent of the department of health or be allowed to leave the hospital against medical advice. If the patient fails to observe the provisions of the "hold," the hospital administration reports the facts to the department of health. The patient is then removed from the hospital to the detention service by due process of law. A "hold" is placed only on those patients who, if not hospitalized, would be subject to forcible hospitalization.

Management

Patients in the detention service receive combined chemotherapy and supportive drug treatment for tuberculosis and whatever medication may be indicated for nontuberculous conditions. Transfer, under "hold," to nondetention hospitals is arranged for patients whose condition, tuberculous or other, requires methods of treatment, especially surgical, or methods of examination for which the Rikers Island Hospital is not equipped.

Sputum concentrates and cultures and drug sensitivity tests are done at the bureau of laboratories of the New York City Department of Health. All other tests and X-ray examinations are performed at the Rikers Island Hospital.

Treatment of the patients is directed and supervised by a consultant on the staff of the bureau of tuberculosis of the health department, who serves as a liaison officer between the department of health and the department of correction. The consultant visits the Rikers Island Hospital every week, submitting his reports and recommendations to the director of the bureau of tuberculosis.

Decisions on transfer or release of detained patients are based on these reports and recommendations.

The medical social workers at Rikers Island and the department of health assist the patients and their families during the time of hospitalization and prepare the ground for care and assistance after discharge.

Release From Detention

Release from detention service is granted to patients whose tuberculosis becomes clinically arrested, and whose treatment and medical supervision can be safely continued outside the hospital.

Also, patients are released who, after a period of observation on the detention service, seem to have acquired satisfactory understanding of their condition and of the need for their continued hospitalization and treatment. Such patients are transferred to nondetention hospitals for the continuation of their isolation. To insure a greater degree of control, a "hold" is placed on them.

Between July 1, 1955, and January 1, 1958, 46 men were admitted to the detention service. They included one readmission case. Fourteen had moderately advanced pulmonary tuberculosis and 32, far-advanced disease. None had minimal disease. Ages ranged from 21 to 72 years with an average of 44 years. The following is the age distribution:

Age group	Number of patients
21-29	10
30-39	15
40-49	8
50-59	10
60-72	3

The majority showed features of antisocial behavior: 16 were alcoholics; 1 was a drug ad-

North Carolina Regulations

Legal regulations applying to the forced hospitalization of recalcitrant patients with communicable pulmonary tuberculosis have been enforced in the State of North Carolina for a number of years. The following appears in section 1, article 19A, chapter 130 of the General Statutes in the Cumulative Supplement of 1949, which was rewritten and ratified by the North Carolina General Assembly on March 29, 1951.

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"The infectious patient that willfully fails and refuses to accept treatment as determined by the local health officer shall be guilty of a misdeameanor and shall be imprisoned in the prison department of the North Carolina Sanatorium. The period of imprisonment shall be for a period of 2 years. The medical superintendent may upon signing and placing among the permanent records of the North Carolina Sanatorium a statement to the effect that such person may be discharged without danger to the health or life of others at any time during the period of commitment. At time of discharge he will give a full statement of his reasons to the health officer serving the territory from which the person came. He also has the authority to transfer the patient from the prison division to the main sanatorium or if a veteran to a Veterans Administration hospital if the patient has demonstrated his willingness to obey the rules and regulations of the sanatorium and State laws."

Confined patients receive combined chemotherapy, supportive hospital treatment, and surgery, as indicated.

The law has several effects on potential irregular discharges:

- Patients know that the local health officer has the power to enforce hospitalization and treatment through court procedures. Patients transferred to the Veterans Administration Hospital at Oteen, N.C., from the prison section have continued their treatment without further trouble and have not attempted to leave against medical advice.
- Patients soon acquire an insight into their condition when they begin to improve as a result of enforced treatment. They soon develop the desire to acquire an inactive diagnosis so that they can be released and returned to their homes. Consequently they adhere to hospital rules and accept treatment.
- When a patient leaves the Veterans Administration hospital irregularly, his local health officer is notified within 24 hours. If he is receiving chemotherapy, a recommendation is also made as to drugs and duration of treatment.
- Chronic alcoholism is a large factor in failure to accept hospitalization and treatment. Enforced hospitalization provides the opportunity to help the patient with this problem.—R. E. MOYER, M.D., chief of the tuberculosis service, Veterans Administration Hospital, Oteen, N.C.

dict; and 6 had records of previous violation of the criminal law. Two had to be removed to psychiatric institutions. The known duration of their disease prior to confinement varied from 3 months to 10 years, with an average of 44.7 months. The duration was less than a year for 7 patients and from 13 to 24 months for 8 patients. Twenty patients had had the disease from 25 to 60 months and 11 patients longer than that.

Each of the 46 patients had had multiple hospitalizations, the maximum being 44, and multiple irregular discharges from hospitals, with a maximum of 28. The average was 7 for hospitalizations and 5 for irregular discharges from hospitals. One patient after his first and only visit to the chest clinic, where his disease

was diagnosed by chest X-ray and sputum examination, refused further attendance at the clinic or hospitalization.

The time elapsed since the last attendance at a chest clinic or last hospitalization varied from 2 days to 2 years, with an average of $3\frac{1}{2}$ months. Twenty-two patients were brought to detention as violators of a "hold." Of the remaining 24, one-third had been out of clinics or hospitals, without medical supervision, for a period of more than 6 months.

Followup

As of December 31, 1957, the patients had spent from 70 to 447 days on the detention service prior to their release or transfer, with an average of 180 days, not considering those pa-

tients who, on December 31, 1957, were still confined to detention. One patient had to be transferred to a psychiatric institution 2 days after his admission to the detention service. He had not been diagnosed as a psychiatric case at any time previously.

Of the 15 patients discharged with arrested disease from detention hospitals up to the end of 1957, 8 originally had had moderately advanced disease and 7 far advanced. Among those discharged from nondetention hospitals after medical treatment only, one had had moderately advanced disease and another far advanced; one of the patients discharged after pulmonary resection had had moderately advanced tuberculosis and three far advanced.

Ten of the group discharged from detention with arrested disease are attending chest clinics where they are receiving medication. One patient had to be rehospitalized in a nondetention hospital because of reactivation of the disease; another was hospitalized for a non-tuberculous condition, and three were lost from clinic followup and are not accounted for.

On December 31, 1957, 8 patients were still confined to the detention service, 1 patient had died there from a pulmonary hemorrhage.

Twenty-two patients had been transferred to nondetention hospitals. In this group, six men achieved arrested status; two of them had medical treatment only, and four achieved arrested status after they had accepted, and received, pulmonary surgery. After regular discharge from the nondetention hospital, these patients are now attending chest clinics.

Four patients managed to escape from the hospital to which they had been transferred from the detention service in spite of the "hold" which had been placed on them. Two patients died in nondetention hospitals, one of them from a nontuberculous condition. At the end of 1957, 10 patients were still hospitalized in nondetention hospitals, 2 of them in psychiatric institutions.

The sputum of 12 patients had become negative prior to admission to detention. Seven of them had been violators of a "hold" while hospitalized in a nondetention hospital and therefore had to be brought to detention. Their last positive sputum had been reported within a month prior to their commitment to detention.

Five patients had been recalcitrant over periods of 3 to 6 months, and their last positive sputums dated that far back.

Fifteen patients were discharged from detention as arrested cases on the basis of negative sputums and gastric cultures and stationary chest films with absence of cavitation, observed over a period of at least 6 months, and also on the basis of predetention reports and findings. Six patients transferred to nondetention hospitals achieved control of their disease and regular discharges as arrested cases. Four patients had surgery and were observed over a period of at least 3 months postoperatively to have negative cultures and stationary chest films with absence of active disease. Two were medically treated patients who were observed for at least 6 months after sputum conversion and who had stationary chest films showing no cavitation and no disease activity.

By December 31, 1957, four patients were still confined to detention, with sputum converted and chest films showing improvement or approaching stabilization over a period of less than 6 months. At nondetention hospitals the corresponding group comprised three patients. The remaining 18 patients, on detention and in nondetention hospitals, were still considered as active cases, either with sputum tests proving activity or with such reports pending.

Discussion

The reaction of the patient to forced hospitalization varied in accordance with his personality. During the consultant's visits on the detention ward, every effort was made to educate the patients about their condition and its clinical and public health aspects. Their clinical records were explained to them and, as far as possible, X-ray findings and changes outlined.

Such explanations had been offered to these patients whenever possible prior to commitment to detention, but the patients were more inclined to accept these explanations after they recognized the improvement from required treatment. The patients were shown that in many instances the prolonged stay and treatment on the detention service had produced good results, even arrest of the disease. The

impossibility of the patient's signing out at will and adherence to strict hospital rules and regulations served as important adjuvants to the medical treatment.

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Prior to their commitment to the detention service, when not submitting to regular treatment, these men had not given themselves an opportunity to experience a favorable development in the course of their disease. For the first time the majority of detained patients were in a position to realize the change in their condition as this was demonstrated and explained. They also learned to understand the need for the protection of the community against infection and for their own care and medical supervision. Some of the patients who formerly had been the most recalcitrant have been attending chest clinics regularly since their release from detention or nondetention hospitals with arrested disease. Others, transferred to nondetention hospitals, have remained there without attempt to leave against medical advice and have shown full cooperation with the hospital staff. However, it is only fair to state that the poorest results were in the group of chronic alcoholics. There were six alcoholics in the group of seven who were lost from further followup after their release from detention with arrested disease or as irregular discharges from nondetention hospitals to which they had been transferred from detention.

The administrations of several nondetention institutions with tuberculosis services requested the transfer to their hospitals of patients in detention who were eligible for such a transfer to demonstrate to their own potential irregular discharges that the department of health can enforce hospitalization of recalcitrant patients who are a menace to public health and who do not accept the regulations of the sanitary code. The fact remains, however, that there exists a small hard core of individuals for whom all efforts to obtain cooperation have no effect, and for this group detention remains the only means of control (12, 13).

Summary

In June 1955, the New York City Department of Health in cooperation with the Department of Correction set aside beds at the Rikers Island Hospital for enforced hospitalization of recalcitrant male patients with active pulmonary tuberculosis who were a danger to public health.

Forcible detention is undertaken only after exhausting all means of enlisting the voluntary cooperation of the recalcitrant patient.

A total of 46 patients, including one who was readmitted, were put on the detention service from its initiation in July 1955 through December 31, 1957. Of these, 20 became arrested cases of pulmonary tuberculosis, either while confined to the detention service or after transfer to a nondetention hospital. There were four irregular discharges from nondetention hospitals. Three patients, released from detention as arrested cases, did not report to chest clinics for continuation of their medical supervision and treatment. Three patients died, one on detention, from a pulmonary hemorrhage, and two in nondetention hospitals, one of them from a nontuberculous condition. One patient suffered reactivation of tuberculosis after his release from detention as an arrested case and while attending a chest clinic. He was rehospitalized in a nondetention hospital.

By December 31, 1957, 18 patients were still hospitalized on the detention service or in non-detention hospitals. Seven of these men showed improvement, bacteriologically and by chest X-ray, quantitatively and qualitatively, which may permit expectation of control of their condition in the future under continued hospital treatment.

The patient who had to be readmitted to detention and who was subsequently transferred for a second time to a nondetention hospital is still hospitalized there. His condition is slowly improving.

The 46 recalcitrant patients treated in about 18 months represent a small proportion of the number of persons in the area with active pulmonary tuberculosis requiring hospitalization. Stimulated by results during this limited period, preparations are being made for expansion of the forcible detention program.

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Children On Their Own

Nearly 400,000 children under 12 years of age have to care for themselves while their mothers work, the Children's Bureau reports. About 138,000 of these children are under 10 years of age.

A special survey conducted for the Children's Bureau by the Bureau of the Census, which covered the arrangements made by working mothers for care of their children during May 1958, also brought out the following information:

Among children under 12 years of age, 1 in 13 whose mother works must look out for himself for varying periods. In the age group 10-11 years, 1 child in 5 is without any care while the mother works.

The number of mothers in the labor force with children under 18 years of age has more than doubled since 1950. During the period studied, a total of 2,873,000 mothers were working full time. Of their 6,665,000 children, 5,073,000 were under 12 years of age. All the children of nearly 1 out of 4 of the working mothers were under 6 years old.

Most of the children for whom day care was arranged were in charge of either fathers or relatives while their mothers worked. About 1,034,000 were looked after by nonrelatives who either came into the children's homes or cared for them in their own homes. About 24,000 children under age 3 years, and 67,000 children between the ages of 3 and 5, were in group care.

Authorities in the Children's Bureau doubt that children under 3 years should be cared for in groups. Such children ordinarily need individual attention from their mothers or from a mother substitute, they say.

Progressive Patient Care

—a challenge to hospitals and health agencies—

JACK C. HALDEMAN, M.D.

THERE has been a ground swell of interest in public health circles during the last several years in reexamining the entire concept and structure of community health services.

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The last two annual meetings of the National Advisory Committee on Local Health Departments of the National Health Council have addressed themselves to such subjects. The American Public Health Association is also studying current patterns of organization of local health departments in relation to the kind of health services most needed today. There has been a rebirth of interest in the research approach to current problems of public health practice—community-oriented research aimed at developing new and better methods of public health services.

Health departments are not alone in recognizing a need to reevaluate their services. Hospitals are also facing this dilemma. On the one hand the medical profession and the American public expect and demand increased and better hospital services; on the other hand much concern is being expressed regarding the ever-rising costs of hospital care. Related to these problems is the need for more trained personnel than are available.

The public has become increasingly aware of the advantages of hospitals and nursing homes for the treatment of illness. Physicians

require the hospital's resources to apply modern techniques of effective diagnosis and therapy. Each year a larger percentage of our population is over 65 years of age, and persons in this age group require twice as much hospital care as younger persons. Some illnesses and injuries, former killers, now are effectively treated, but at the expense of many days in the hospital. Further, we may expect that better methods of financing will increase hospital use by people who do not use them now because of economic barriers.

Hospital Costs

Some of the very factors which increase hospital use also increase costs per hospital day. The advances in scientific medicine increase comfort and save lives, but more people, space, and equipment are required to do the job. In 1946 each hospital admission required an average of 4 laboratory procedures; today the average is 14. Although illness occurs on a 7-day week, hospital employees are gradually achieving the 5-day workweek. The short workweek, inflation, and the need for greater skills, plus competition for scarce personnel, has forced salaries up. An increase since 1946 of general hospital personnel from 1.5 to 2.0 employees per patient, coupled with salary increases, makes higher per diem costs inevitable.

Thus, hospitals are faced with having to provide more hospital days at higher costs per day.

Some comfort can be taken from factors which tend to offset these trends. Some medical discoveries—and hopefully more in the future—eliminate the need for hospitalization for some illnesses. Others have helped shorten the

Dr. Haldeman is an Assistant Surgeon General and chief, Division of Medical and Hospital Facilities, Public Health Service. This paper was presented in basically the same form at the meeting of the Surgeon General with the State Hospital and Medical Facilities Survey and Construction Authorities, March 10, 1958.

average hospital stay. Improvement in managerial efficiency is a third factor.

Since it is clear that hospital costs and needs for scarce personnel cannot be reduced by arbitrarily cutting back services, hospital people feel it essential to review hospital operations critically; to isolate areas where increases in efficiency can be instituted without sacrificing quality of care. They feel that an important method of coping with their present dilemma lies in the systematic study of such areas and in the application of the results of research to the development of:

- More effective organizational patterns for the provision of medical services to the people.
- Better community planning for hospital facilities and better coordination of facilities within a community.
 - · Better techniques of administration.
- Improvement in the design of the physical plant.

This at the very same time that public health workers are asking how the health department can reorient its programs to meet more adequately the major health problems of today.

Hospital and public health personnel are both dedicated to the same goals. In the past, however, they have directed their primary efforts to opposite ends of the spectrum of the need for services. The hospital administrator has concerned himself largely with service to the acutely ill patient; the public health official has devoted his efforts principally to preventing disease; and the voluntary health agency has concentrated on gaps in health services. But there is beginning to appear unmistakable evidence of the willingness of these three groups to work together in planning complete community health programs.

Increasingly in the future, I believe, official and voluntary health agencies will sit down jointly with hospital planners to assess the need for community health facilities and services.

New Patient Care Concept

From the hospital side, there is already evolving a new concept of organization of services which shows promise, the concept of progressive patient care. This development has arisen from the attempt to better administrative devices for providing the health services most needed by the people.

Many hospitals are now incorporating one or more of the progressive patient care elements in their procedures. It, therefore, behooves both hospital and public health worker to examine this concept and identify their own possible roles.

The central theme of the progressive patient care concept is the organization of facilities, services, and staff around the medical and nursing needs of the patient. Its objective is that of tailoring services to the needs of the individual patient, whether in the hospital or the home. Patients are grouped according to their illness and their need for care. The staff serving each group of patients is selected and trained to provide the kind of services needed by that group.

The progressive patient care concept envisions the general hospital of the future as the focus of both outpatient and inpatient care; as much concerned with care of the long-term patient as with the treatment of the short-term patient; as readily available for assisting the physician with care of his patient in the home as for assisting him with care of the patient in the hospital.

Five elements are usually associated with the concept of progressive patient care in the general hospital: intensive care, intermediate care, self-care, long-term care, and the extension of hospital services through organized home care programs.

In the intensive care unit, critically ill patients are concentrated in one area regardless of diagnosis. These patients are under constant audiovisual observation of the nurse, with life-saving techniques and equipment immediately available, and with nursing staff selected and trained to care for this type of patient.

In the intermediate care unit are concentrated patients requiring a moderate amount of nursing care, not of an emergency nature, many of whom are ambulatory for short periods and who are beginning to participate in the planning of their own care.

The self-care unit gathers patients who are physically self-sufficient and require only diagnostic or convalescent care which can be provided in hotel-type accommodations.

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In the long-term care unit are patients requiring prolonged care.

Home care, the fifth element of progressive patient care, extends hospital services into the home to assist the physician in the care of his patients.

By concentrating patients with similar nursing needs into separate units in this manner, the staff can be selected, trained, and adjusted in number to render maximum service. Physical facilities can be planned accordingly.

There are many unanswered questions regarding progressive patient care. Much additional research is needed. For example, we can, at this time, only speculate on its possible effects on hospital costs. Also, there are other administrative devices for improving services which should be tested.

The basic concept of progressive patient care is far broader than its relationship to the general hospital. A similar trend has been developing in the mental health field. There is growing emphasis upon the provision of community facilities and services for patients with mental disorders, in contradistinction to continued enlargement of State institutions for the care of the mentally ill. Again, the objective is to look at the patient in accordance with his particular needs. Here, application of the progressive patient care concept leads to consideration of the need for a psychiatric unit in the general hospital, diagnostic and treatment facilities on an outpatient basis at the community level, including separate clinics, a halfway house involving sheltered care and group therapy, the so-called day hospital or night hospital, sheltered workshops, and home care programs.

In modern treatment of tuberculosis, too, treatment begun in a hospital can now be continued safely and effectively in the home at a relatively early stage.

Clearly, effective patient care, directed to the total needs of the patient requires better community planning than now exists in most places. Certainly public health workers should actively participate in this planning. In many places, the health officer can be the initiator of certain aspects of the program, assuming responsibility for the organization rather than the provision of services. Public health workers are well equipped to contribute to the long-term care and home care aspects of progressive patient care. By virtue of the multidisciplinary character of the health department staff and the focus of their training, they are accustomed to working as a team. They are also accustomed to teaching the patient and the family how to do for themselves rather than doing for them.

Before this potential contribution can become reality, however, public health people must demonstrate a willingness to supply the necessary skills. They must also fully accept, as a public health responsibility, the role of assisting the physician in the care of his patient through the provision of such services as home care programs. Actually, in places where public health workers are engaged in followup of patients discharged from tuberculosis and mental hospitals, they are already involved in some facets of progressive patient care. Extension of this responsibility to other types of long-term care, especially that associated with chronic illness and other long-term disabilities, should not be too difficult a hurdle to take. And yet, some brave new thinking is required.

It is relatively easy to determine for the community as a whole the magnitude of facilities and services needed for intensive, intermediate, and self-care, since these are measured in terms of hospitalized patients. Within the hospital, there can be a daily evaluation of the number of patients requiring each kind of care. With respect to long-term care, however, the situation is more complex. Here we are concerned with a dual problem: On the one hand are the many patients in general hospitals who could be transferred to a long-term care facility; on the other hand, many disabled persons are scattered throughout the community who would benefit by such care if it were available. The health officer and his staff are in a strategic position to assess the scope of the need for this latter type of care.

The home care segment of the program presents quite a different dilemma. For other elements, the organizational framework within which the service is provided is quite clearly that of the hospital or long-term care facility. For home care, some services are supplied by the hospital and some by other community

agencies. This is the stage of the full sequence of care in which the health department might be expected to have a major role. A wide range of services is desirable if maximum assistance is to be given the physician in the care of his patients. Physical therapy, occupational therapy, home nursing care, social services, X-ray, laboratory services, nutritional aid, and homemaker services, to name a few. The health department has an important role in giving guidance and leadership in developing resources to provide the services needed. Some of these can be supplied by the health department. Some can more appropriately be obtained from other sources. Not always will the same agency be the provider of service. The health department must be willing to fill in the void and equally willing to promote the use of and to lend its support to services already available under other auspices.

Hospital-based services are, perhaps, more apt to give continuity of care than those based elsewhere. It is easier for one organization to assist the physician in management of the patient's full regimen of treatment, even when some of the services used are provided from other sources. A home care program must be medically supervised, and adequate medical records must be maintained. Although an underpinning of financial support for the program will be needed if services to the medically indigent are to be provided, provision should be made for patients to pay for services whenever possible. The business office of a hospital can incorporate such payment in its regular system of patient billing without difficulty.

In some communities, particularly those with several hospitals, more complete coverage may be obtained through a home care program with services emanating primarily from the health department. A great deal more study and research is needed in this area to establish principles for the most effective organization of home care programs.

Nursing service may be provided equally well from the hospital, the health department, or the visiting nurse association. In weighing the ability and responsibility to provide this, or any other part of the total services needed, hospital and public health workers will have to think in terms of services the people need, the

services they want, and the methods by which they can be furnished.

Joining Forces

Misunderstandings concerning who is responsible for what may be avoided by formal documentation of the relationship of various services. Likewise, the methodology of getting patients transferred from one service to another must be carefully worked out and understood by all participating agencies. A few communities have made a good start in this direction.

It is not uncommon for a health department to use hospital outpatient facilities for its heart, tuberculosis, or prenatal clinics. On the other hand, except for obstetrics and occasionally pediatrics, many public health workers still do not instinctively think of cooperative enterprises in which the health department and hospital jointly participate. As a local health officer some years ago, I certainly did not.

During the past few years, State health departments have been drawn closer to hospital and nursing home operations and their problems through their licensing and inspectional programs. As a rule, however, and perhaps of necessity, this has been a highly centralized function of a relatively small staff in the State health agency. The rank and file of public health workers have not participated to any considerable extent.

Health leaders are engaged in a never-ending search for ways and means to provide the kind of services the people need in ways that are most acceptable to them. In these days, when the chronic diseases and other long-term disabilities are the dominant clinical burden, neither the hospital nor the health department can escape its share of responsibility for providing the services such illnesses require.

By joining forces in a well-organized program of providing services tailored to meet patient needs, progressive patient care in its broadest concept, the resources of both the health department and the hospital can be used to far greater advantage to serve the total health needs of the community. At the same time, a vast new area of interest and of service will be opened to hospital and public health workers alike.

Air pollution is an undesirable and in many cases unnecessary byproduct of human activity. Its annual cost to the Nation, estimated at between \$1.5 and \$4 billion, does not include impairments to health, which cannot yet be accurately appraised, or the psychological damages associated with living and working in a befouled atmosphere.

The first National Conference on Air Pollution, was held November 18–20, 1958, in Washington, D.C., to assess the effects of air pollution and progress toward abatement. Summaries of 15 of the technical papers presented at the conference follow. These have been selected by the editors of *Public Health Reports* with the interests of our readers in mind. Many of the others have been distributed in quantity. Complete proceedings of the conference are for sale (\$1.75) by the Superintendent of Documents, U.S. Government Printing Office, Washington 25, D.C.

Effects on Health

Knowledge of what air pollution does to human beings is steadily briet progressing.

It is clear from experiences in the Meuse Valley of Belgium in 1930, in Donora, Pa., in 1948, and in London in 1948, 1952, and 1956 that under certain meteorological conditions pollutants in the air may build up to lethal concentrations. In spite of the fact that the deaths in these acute episodes are linked to air pollution, the mechanism by which the deaths occur is far less clearly understood. The concentration of specific pollutants in these acute episodes did not approach levels considered dangerous for working conditions in industrial plants.

Exposure to certain types of air pollutants over long periods of time can cause chronic bronchitis. This clinical entity is well recognized in Great Britain. But the exact mechanism of causation is not understood.

Other inferential evidence links air pollution with illness. Death rates for arteriosclerotic and other heart conditions and cancer of the stomach, esophagus, and lungs are higher in urban than in nonurban communities.

Based on a paper by James P. Dixon, M.D., commissioner, Philadelphia Department of Public Health.

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pollution is more intense in urban areas, but we cannot say, at present, that a cause and effect

relationship has been established.

Throughout the industrialized world, lung cancer is showing a striking increase as a cause of death. Cigarette smoking has been implicated as an associated factor. However, even after correcting mortality rates for lung cancer for the effects of smoking habits, the incidence of lung cancer is still significantly higher in urban than in rural areas.

Observations indicate that a number of the pollutants in the air of some communities can produce cancer in experimental animals. This information, which does not verify that air pollution is a cause of cancer, seems to demand that the relationship between the two be explored thoroughly.

In the past, public health personnel have frequently had to operate upon generalizations and to develop control measures before the specific etiology of the disease was known. Present knowledge is sufficient to warrant a fundamental concern about the effects of polluted air upon health.

The available data demand a reasonable effort to reduce the quantity of pollution in the air and vigorous research on the specific effects of air pollution on health. Expanding industrialization in the United States and in other parts of the world make such efforts and research urgent, lest gas masks become as common as shoes.

Effects of Irritants

brief

Still uncertain is the relationship to general health impairment of the moderate concentrations of irritants found in the air of our larger cities.

Ready reactivity with tissues seems to be the only factor common to the materials classified as irritants. The biochemical reactions involved in the irritant effect differ. They may be direct and essentially corrosive in nature, as is sulfuric acid. Aldehydes presumably react

Based on a paper by Norton Nelson, M.D., director, New York University Institute of Industrial Medicine, New York City. with cellular proteins. Ozone is a strong oxidant. Other irritants interfere primarily with some of the intracellular enzyme systems.

In each case, there is a direct and damaging local chemical action on the cell. In most instances this action is immediate or rapid. However, changes secondary to the direct effect can require hours or months for full development.

As defined in this paper, the category of irritants includes sulfur dioxide, sulfuric acid, acid sulfates, ozone, the nitro-olefins, recently identified and shown to be strong eye and pulmonary irritants, and a number of organic free radicals, aldehydes, and higher oxidation products of hydrocarbons.

Both the nature and the extent of the biological response are modified by the relationship between the physical and chemical properties of the irritants and the structure and responsivity of the lung. When a sufficient concentration of irritants contacts the upper airways, coughing and respiratory distress shortly result. Other effects on the lining tissues of the bronchi are interference with the action of the cilia, the lung cleansing system, or change in the rate of secretion of mucus. Damage to the cilia and change in their rate of motion have been shown to result from exposure to sulfur dioxide and synthetic smog. Gases of high solubility may not penetrate beyond the conducting airways and so the effects of the kind just described are all that might be seen.

Effects on the Alveoli

However, when irritants enter the alveoli, the consequences are different. Here the primary, immediate effects appear to be on cell permeability, or what may be called the "leakage rate." Generally, the effect leads to the passage of fluid into the alveolar spaces from the bloodstream. Also, there may be a change in the caliber of the capillary blood vessels in contact with the alveoli. The fluid increases the distance through which oxygen and carbon dioxide must diffuse, impairing their exchange, and reduces the space available for gas in the lungs. In extreme instances, whole sections of the lung may be unusable because they are literally drowned in fluid.

Thus these irritant gases in the deep lungs

make respiration more difficult and increase demands on the heart. It is through such mechanisms that the irritant gases in gas warfare or in intense accidental exposure cause severe symptoms or death. The movement of fluid into the airspaces often requires time to develop into a serious threat, and the full effects may be delayed hours or several days.

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Since the scrubbing action of the upper airways may prevent highly soluble gases from reaching the deep lung, it is the irritant gases of moderate and low solubility that are of particular importance in producing irritation of the deep lungs. However, there is some evidence that the simultaneous presence of particles may aid in the transport of the more soluble gases into the deep lungs.

The effects of the irritant materials already discussed do not necessarily represent permanent irreparable damage. Function has been interfered with but structure has not been irreversibly altered. Accordingly, recovery might be complete after a single nonfatal exposure, and, with low levels of exposure, the irritant consequences might not even be observable. But it is not unreasonable to infer that a person who has pulmonary edema or a heart already strained to the maximum would be able to tolerate lesser interference with the respiratory system than healthy persons. These are some of the grounds for concern about the effect of moderate concentrations of irritants on persons already under a disease stress. functional effects have been readily apparent with the intense exposures occurring in several air pollution disasters.

These functional effects are much less evident, and possibly insignificant or absent, with the level of irritants present in the majority of cities of the United States. If health impairment of this sort is contributed to by moderate levels of contaminants, their identification and measurement may be difficult because of their threshold nature and because similar symptoms are found in individuals with disease whether the air is polluted or not.

The phenomena already mentioned deal with dynamic changes in the functioning of the lungs, not structural damage. But there is some basis for concern that continued irritation may lead to definite organic damage to the

lung tissues. This has been the implication of British studies which associate high bronchitis rates with high levels of pollution. Also, work done in Dr. H. E. Stokinger's laboratory suggests that continued exposure to low levels of ozone may produce fibrotic changes in the lungs of experimental animals. Other possible but uncertain consequences of the prolonged action of irritants might include emphysema, lowering of resistance to infection, and, through interference with the lung's excretory mechanism or otherwise, increased susceptibility to lung cancer from inhaled carcinogens.

The irritants may be in the form of gas, tiny particulates, or smog particles of oxidized hydrocarbons. The larger particulates tend to be screened out in the upper respiratory system, while the smaller are more likely to penetrate the deep lungs. The suspended particulates that typically are found widely distributed are generally in the smaller sizes which readily enter the pulmonary systems. These particulates may be irritants themselves or may intensify the action of an irritant gas.

Synergism

Of concern for some time has been the possibility that the presence of particulates might synergistically potentiate the irritant action of gases. Two major possibilities are that if irritant gases are dissolved in or absorbed on particulates, they may be carried past the normal protective mechanism of the upper respiratory passage and reach more vital parts of the lung, and that a more intense local dose may result at the point of contact than would occur by normal gas absorption, due to a high local concentration of adsorbed gas around the particle.

Experimental verification of potentiation in animal studies appears to have been accomplished by the work of Dr. Charles Labelle and Dr. Mary Amdur. Goetz has suggested that this potentiation may be of general importance and has outlined some of the characteristic interrelationships of gases and particulates which would determine whether synergism would occur or not.

We are dealing with dose-related phenomena, that is, the greater the dose or insult, the more intense the response. Over past years a widely accepted series of guides for safe concentrations of toxic materials in industry has been developed. I need not labor the irrelevance of standards established for these special circumstances to the general pollution situation where persons are exposed for a lifetime and perhaps around the clock, whether ill or well. Eventually we may have sufficient knowledge to set up analogous standards for air pollutants; we do not have such information now.

At present we are confronted with one of the most difficult tasks ever given biologists, extrapolation from doses producing readily measurable responses to lower and threshold levels. The quantitative relationship between dose and effect is practically never a simple linear one. In fact, with most irritant materials there appears to be a "no effect" level; very low rates of dosage can be dealt with by the body's protective mechanisms without damage.

From this standpoint spiking concentrations of relatively brief, high levels may be more damaging than the same amount of materials inhaled uniformly over a long period. Our uncertainty as to the presence of threshold, and if it exists, its quantitative level, is an additional, vexing uncertainty.

Accordingly, we have grounds for suspicion that respiratory irritants may be a significant health concern. Even for the higher concentrations found in our urban areas this is still based largely on inference from the points I have made. An effort consonant in extent with these suspicions is required to clarify the problem.

Lung Function Changes

brief

Toxic substances in toxic amounts have not yet been found in community air pollution. What is found are substances in amounts sufficient to cause widespread irritation of the eyes, nose, and throat. What can these substances do to the vital function of the lungs?

Based on a paper by John R. Goldsmith, M.D., head, air pollution medical studies, California State Department of Public Health, Berkeley.

In the lungs and airways water vapor and heat are added to the air so that when it reaches the alveoli, the air is saturated with water vapor and is the same temperature as the blood. The conducting airway is lined with a layer of mucus which is continually moved toward the throat by the beating of tiny whiplike cellular projections called cilia. Larger particles of irritating air pollutants are caught in this mucus, and thus the lung is partially protected. But the smallest division of the airway, the bronchiole, with a diameter of 0.016 inch, has no layer of mucus to protect the cells which form its walls.

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We are not certain whether irritants in the air cause the cells lining the bronchiole to swell up, cause the glands to increase their secretion of mucus, or produce contraction of the muscle cells which are wrapped around the bronchiole. Laboratory studies suggest all three effects are possible, and any of these reactions would decrease the caliber of the bronchiole.

One method of estimating the effects of irritating air pollution is to study resistance to airflow within the lung. Resistance to airflow is inversely proportional to the fourth power of the diameter of the conducting tube. For example, a caliber decrease of one-fifth will approximately double the resistance to airflow.

The normal person can greatly increase the amount of air with which gases are exchanged in the lung; the effort needed to produce the increase is kept to a minimum by the low resistance to airflow through the bronchi or bronchioles. An increase in this resistance means that the reserves of lung capacity are available to normal persons only with increased effort. For persons ill with asthma, emphysema, or heart trouble, who have little or no reserves, this added effort may tip the scales unfavorably.

If irritating substances produce edema and thickening of the wall of the alveoli, there certainly may be interference with gas diffusion through this wall. Dr. Geoffrey Carey and his colleagues at the University of Cincinnati have worked out methods for studying this effect and have observed some impairment of the diffusion capacity associated with air pollution episodes in Cincinnati.

The effect of air pollution on lung airway resistance has been studied in several ways. Dr. Mary Amdur at Harvard developed a

method for measuring the effect of gases on the airway resistance of guinea pigs. She found that the presence of minute droplets of common salt solution in the air greatly increases the guinea pig's sensitivity to sulfur dioxide. In salt mist the concentration of sulfur dioxide at which the animals' airway resistance increases is very near that which occurs during episodes in which sulfur dioxide is a major pollutant.

Experimental studies of the effects on man are not so conclusive. The difficulty is in measuring the pressure gradient between two points in the lungs and the flow that corresponds to

that pressure.

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Dr. Arthur DuBois, University of Pennsylvania, measured pressure in the human lung by sealing the subject briefly in a telephone-booth-like box, a body plethysmograph. From a simple physical equation relating pressure and volume, lung pressure can be obtained. Using this sensitive measuring device, he found that inhaling a fine dust of charcoal powder or aluminum or a mist of India ink increased resistance to airflow two or three times. These substances are not known to be irritating, and the subjects were not aware of any resistance to breathing.

Recent studies use less direct methods based on these principles. It is known that as pressure applied to make air flow out of the lungs increases, the flow diminishes until increasing the pressure no longer increases the flow. If the subject takes in as much air as possible and then blows it out as fast as he can, the maximal rate of airflow can be measured and the effect of pressure can be ignored on the assumption that wide differences in pressure do not influence the maximal flow rate. The maximal flow rate then becomes an indirect way of estimating the flow resistance, and a drop in the maximal flow rate is assumed to indicate a rise in flow resistance.

Dr. Van Sim studied the effects of sulfuric acid mists and SO₂ in human volunteers at the Chemical Defence Experimental Establishment at Porton, England. Conventional pulmonary function tests showed no consistent change but he did observe an increase in airway flow resistance.

Several studies of persons exposed to air pol-

lution have been made in California. Dr. Hurley Motley collected data on patients with severe chronic pulmonary disease while they breathed the Los Angeles air during smog episodes. He found that the lung function of some patients improved when they breathed filtered air.

Dr. Charles Schoettlin assigned by the Public Health Service to the California State Department of Public Health has been measuring vital capacity, timed vital capacity, and maximal flow rate and making clinical evaluations of men at the Veterans Administration Center in Los Angeles. His subjects with chronic disease of the lung are matched for age and smoking history with another group of men without lung disease. These two groups will be compared with respect to their reaction to air pollution and other environmental factors.

Tumor Production

brief

Certain epidemiological facets of the increasing incidence of lung cancer suggest that the atmospheric environment may be causally associated with the increase. The epidemiological data indicate areas for experimental biological efforts.

While these experiments necessarily are limited to animals, much significant information can be obtained. Such experiments, by employing large numbers of animals, permit the study of sequential changes in the development of an adverse response. Frequently, it is also possible to assess carefully the factors of host resistance in overcoming these negative effects. Protective or therapeutic measures to control the effects of air pollutants can be quantitatively studied. And, within limits, practically any state of health at any age in man can be duplicated in animals. The ultimate goal of such tests is to select laboratory circumstances most nearly duplicating the human experience.

Despite the existence of many variables, past

Based on a paper by Paul Kotin, M.D., associate professor of pathology, University of Southern California School of Medicine, Los Angeles.

experience has shown a high index of meaningfulness to man of the experimental data for animals.

All available evidence in lung cancer points to a dominant etiological role for exogenous agents present in our respiratory environment. Since cancer rarely develops subsequent to the action of a single factor, atmospheric pollution must be regarded as one of the multiple factors, operating in combination, that result in lung cancer.

The isolation and identification of specific causative agents and the determination of their mode of action have been primarily laboratory undertakings. Following are the accomplishments to date.

• Carcinogenic aromatic polycyclic hydrocarbons have been demonstrated and quantitated in polluted atmosphere of urban communities. Compounds identified include 3,4-benzpyrene and 3,4-benzfluoranthene. These agents have been used to produce skin cancers and subcutaneous sarcomas in C57 Black and strain A mice by painting and injection.

• Carcinogenic properties have been demonstrated in fractions of the atmosphere that are free of aromatic polycyclic hydrocarbons. Compounds belonging to the group of oxidation reaction products of aliphatic hydrocarbons have been used to produce skin cancers when painted on C57 Black and strain A mice.

• Ozonized gasoline has been used in inhalation chambers for the production of lung tumors in strain A and C57 Black mice. These tumors, while differing structurally from human tumors, are nevertheless unequivocally new growths. Their more indolent natural history in mice may well be a reflection of host resistance factors rather than an indication of lack of carcinogenic potency in the aerosols produced.

• Carcinogenic materials have been identified in the air in a particulate state that permits their being breathed and deposited on the lining of the lung. Many of these cancer-producing agents are chemically stable and they survive sufficiently long after emission from pollutant sources to be potential biological threats.

• Atmospheric irritants of all types, for example aldehydes and organic acids, though in themselves noncarcinogenic, may play a role in

the development of cancer by interfering with the normal flow of the mucous stream on the lining cells of the lung. This continual flow of mucus normally serves to prevent the accumulation of deposited material on the respiratory epithelium. Irritants can reduce the activity of the cilia that move the stream along, so that stasis occurs and particle accumulation can follow.

 Protein materials normally present in blood and cells are capable of freeing cancer-producing chemicals from the particles on which they are carried so that biological activity can result.

All of these findings were consistently demonstrable in various species of animals studied. Ample evidence exists to suggest that the behavior observed in the laboratory is closely analogous to the situation occurring in man. It is generally accepted that cancer develops in steps and, logically, any one of the causative links in the chain can be supplied from other environmental sources.

Irritants may come from occupational surroundings, from cigarette smoking, or from the specific biological reaction to repeated viral or bacterial infections. The carcinogenic agent may similarly be derived from other environmental sources. Atmospheric pollution, however, uniquely supplies the links necessary for the experimental induction of lung cancer. Without contrary evidence this observation, coupled with the epidemiological characteristics of the disease, strongly suggests a similar action in man.

Chronic Bronchitis

It is difficult to compare the effects of air pollution on the health of the British people with these effects in the United States. The nature and concentration of air pollutants in the two countries differ greatly. For example, in 1952 about 30 percent of the energy derived from mineral fuels in the United States came from coal; in Great Britain 95 percent of this energy was

Based on a paper by Geoffrey C. Carey, M.D., department of social and preventive medicine, Institute of Clinical Science, Queen's University, Belfast, Northern Ireland.

derived from coal, a large portion of it soft coal burned in domestic open fires.

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Air pollution levels in a typical city of the United States, such as Cincinnati, are a tenth of those experienced in London smog. Differences in housing and social conditions must also influence the incidence of specific diseases. And there is no good evidence that the diagnosis of chronic bronchitis is based on the same criteria in the two countries.

In the United States there seems to be no clear pattern of urbanization and geographic distribution among States having the highest incidence of chronic bronchitis. In Great Britain the occurrence of this disease, more than any other, increases sharply as one moves from the country through the suburbs to the centers of industrial conurbations. Other factors in the occurrence appear to be cigarette smoking, population density and domestic overcrowding, low socioeconomic status, and sex.

However, it has been demonstrated that patients who suffer from chronic bronchitis, as diagnosed by British criteria, and live in an industrial city in the United States show a worsening of symptoms with increases in air pollution.

The outstanding symptoms of chronic bronchitis are coughing and the production of excessive amounts of sputum, often containing pus. The diagnosis of chronic bronchitis should not be made until other forms of lung disease have been excluded and the patient has had increased cough and sputum either in the winter months or all year round for not less than 3 years.

Chronic bronchitis is an important cause of sickness absence in British industry. In 1951, 27 million man-days were lost from this cause in an insured working population of 25 million. The impact of the disease is even greater, as illnesses of 20 million uninsured persons are not included in this figure. England has the highest reported rate of chronic bronchitis, 65 per 100,000, and the United States the lowest, 2 per 100,000.

The effects of air pollution on health have been and are being studied in several ways in Great Britain. Four major smog episodes have occurred in London since 1948. Each was followed by an increased number of deaths compared with mortality experienced in the same weeks in smog-free years. Nearly 600 excess deaths occurred after the episode of November 1948, 2,500 followed the episode of December 1952, 500 the January 1956 episode, and 400 the December 1957 incident. Very young children, old people, and persons suffering from severe heart and lung disease have been shown to be those most susceptible.

A. S. Fairbairn and D. D. Reid of the London School of Hygiene have studied mortality in the general population of Great Britain between the ages of 45 and 60 years. They reported that deaths from bronchitis are significantly related to visible smog, population density, and domestic overcrowding, and that deaths from pneumonia in men were significantly related to fog and population density.

Examination of the health records of mailmen in Britain showed a significant correlation between visible fog and sickness absence and "bronchitis wastage" (mailmen dying in service or prematurely retired because of chronic bronchitis). Over a 7-year period, the sickness experiences of a 3 percent random sample of executive and clerical government workers were similar to those of mailmen 20 years younger.

Three research groups are now carrying out prospective studies. Dr. P. J. Lawther is following some 200 chronic bronchitis patients of St. Bartholomew Hospital's wards and outpatient clinics. In an interim report he stated that the patients tend to feel worse immediately before the onset of visible fog, and that their symptoms increase and decrease in much the same pattern as simultaneous measurements of smoke and sulfur dioxide.

A Medical Research Council group is collecting daily measurements of smoke, temperature, humidity, and gaseous acid from 29 sampling stations in the city of Sheffield. The measurements are the basis for simultaneous surveys of three groups: the general population of the city, 100 chronic bronchitic patients, and 700 children who entered the first grade in 1956 and will be followed in a long-term study.

In 1957 the College of General Practitioners selected 100 of its members living in areas of varying levels of air pollution to participate in a survey. The physicians are following a num-

ber of patients throughout the year by means of clinical records and objective tests of lung function. Their reports are being collected and analyzed by the Medical Research Council.

Automobile Exhausts

brief

Exhausts from gasoline-propelled vehicles contribute pollutants to the air in large quantities. In a particular area, the significance of the quantities is influenced by the availability of diluting air and by meteorological factors which govern the formation of reaction products from the primary pollutants.

In Los Angeles County it has been necessary to assess these pollutants qualitatively and quantitatively. More than 5.5 million gallons of gasoline are used each day and 2,750,000 cars and trucks are registered in the county. Cooperative studies by the Los Angeles County Air Pollution Control District, the automobile manufacturers, the Bureau of Mines, and other agencies leave no doubt that automobile exhaust is a source of air pollution.

On the average, 1,000 gallons of gasoline consumed in automotive engines releases the following substances to the air:

Substance Number	of pounds
Carbon monoxide	3, 200
Organic vapors	200-400
Oxides of nitrogen	25-75
Aldehydes	18
Sulfur compounds	17
Organic acids	2
Ammonia	2
Solids (zinc, lead, other metallic oxides,	
carbon)	0.3

However, individual cars vary substantially in the amount of pollutants they produce, according to engine, fuel, and operating variables.

The significance of these substances does not depend entirely on weight. If the air movement is sufficient to dilute the waste products, their concentration in the air may not reach the objectionable level. Therefore, data on Los

Based on a paper by Leslie A. Chambers, Ph.D., director of research, Los Angeles County Air Pollution Control District.

Angeles cannot be applied to other areas without considering factors causing dilution.

In Los Angeles the relative capabilities of these substances for reaction to form new products must also be considered. For several years it has been known that some organic compounds react photochemically to produce ozone, oxidation products such as aldehydes, and various transient and stable secondary products. Recently, methods based on infrared absorption and gas chromatography have helped to determine the relative participation of various organic molecules in the reactions of smog formation.

Certain unsaturated organic compounds appear to be more important than others in producing secondary reaction products. The possibilities of selective removal or elimination of these fast reactors should not be overlooked.

An automobile also loses substantial quantities of gasoline vapors from fuel tank and carburetor vents. The losses from both sources are minimal at temperatures of 80°F. But at 95° to 100°F., temperatures which often coincide with periods of most intense smog, the carburetor evaporation losses from Los Angeles driving approximates 40 tons of gasoline vapors an hour, a rate roughly equivalent to hydrocarbon losses from the exhausts. Tank evaporation contributes additional but lesser quantities. However, the vapors may contain less unsaturated hydrocarbons than the fuel being used.

The automobile engine is a major contributor of oxides of nitrogen, essential ingredients of the smog-forming reaction. Some authorities maintain that emissions of oxides of nitrogen as well as hydrocarbons must be reduced to abate the smog successfully in Los Angeles.

The large amounts of carbon monoxide emitted from exhausts are a benefit and a potential danger. In concentrations of more than 150 ppm it is a health hazard. In any concentration, CO affords a useful index of the distribution and degree of dilution of other constituents of exhausts. This is possible because exhaust emissions are, overwhelmingly, the principal source of CO, and the gas does not appear to be consumed by reactions in the atmosphere.

Any metropolitan area with petroleumpowered vehicles as the basis of its transportaF

tion receives the same primary exhaust pollutants per 1,000 operating vehicles as Los Angeles. In some areas the resultant concentrations may be tolerable. In Los Angeles these exhausts are basically responsible for serious community air pollution. The pollution will increase with the number of automobiles until an effective means is found to eliminate substantially some constituents of the exhaust.

Automobile Industry

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Air pollution affects the automobile industry somewhat differently than any other.

In manufacturing and selling almost 70 million motor vehicles now operating in the United States, the industry has encountered several aspects of air pollution abatement.

The early 1- and 2-cylinder primitive automobiles trailed billowing clouds of smoke, and by eliminating this smoke the industry achieved its first success in abating air pollution. In the 1920's, undesirably high concentrations of carbon monoxide developed during peak traffic congestion in some large cities. In the 1930's this concentration was reduced as much as 50 percent in some cities solely by increasing the efficiency of fuel-burning in gasoline engines.

The high-compression engine required gasoline containing tetraethyl lead, which created the possibility of a new hazard. After laboratory research by industry and the Bureau of Mines, the top limit of lead concentration compatible with public safety was determined and promulgated.

In the past decade, certain invisible, hard-to-measure emissions under certain atmospheric conditions and intense sunlight have been found to combine with portions of the air into something that is blamed for reduced visibility, irritation of the eyes, and other effects. To the extent that these effects are due to tailpipe emissions, they are as undesirable to us as to others.

Based on a paper by Harry A. Williams, managing director, Automobile Manufacturers Association, Detroit.

The automobile industry has authorized cooperative research, spending about \$1 million a year for the past 5 years. Some devices have been developed which show promise in the laboratory stage. Any that prove practical enough to be put into production will, of course, be marketed.

To find the cause of the undesirable emissions, basic studies of combustion have been made. Some emission seems to be unavoidable. At present, motor vehicles in the hands of users are being studied to determine if maintenance procedures can reduce typical emission. The issues that may be involved, an individual car owner's free choice of how he uses or abuses his car, are social and economic as well as scientific.

We have good cause to hope that this research will help to discover the cause of these undesirable effects and what is needed to control air pollution in every area that is affected.

Steel Industry

brief

Recent accomplishments illustrate what the steel industry has done and is endeavoring to do to abate air pollution.

In 1950 the situation was less than ideal. The conditions of pollution were not even defined because there were no simple, effective, inexpensive instruments which could take a truly representative sample of the ambient atmosphere or of stack gases. That year the American Iron and Steel Institute, in behalf of the industry, signed a contract with the Industrial Hygiene Foundation of America to develop such instruments.

As a result, investigators devised an automatic smoke filter which samples the atmosphere for short periods and permits the tracing of variations in smoke intensity, a hydrogen sulfide sampler, and an instrument for measuring hourly dustfall rates.

A critical examination revealed that no one existing device enabled the industry to meet all

Based on a paper by Max D. Howell, executive vice president, American Iron and Steel Institute, New York City.

the requirements for clean air. A research project at the Harvard School of Public Health developed a new type of continuous self-forming filter revolving on a horizontal plane. It combines the versatility of a scrubbing or washing device for gases with the high efficiency of a fiber filter for particulate matter. The wools, made of blast furnace slag, are reusable and 90 percent efficient. Three pilot filters have been built and tested and a fourth is being designed.

Although the institute became actively interested in the control of air pollution in 1950, individual steel firms began much earlier to seek out and correct obvious causes of air pollution. Steam boilers were converted from coal to gas, and process heating furnaces to natural gas or electricity. Locomotives, cranes, and river boats were powered by diesel rather than steam engines.

Air is the raw material used in the largest quantity by the steel industry. More than a billion tons of air, which must be returned to the atmosphere, are used to produce 100 million tons of steel. In many instances the discharged air contains coarse and fine particles which originate in the mechanical and chemical reactions of the manufacturing processes. These particles are not the result of inefficient or sloppy practices. They are inherent in the steelmaking process.

Coke ovens have been and are sources of smoke. Those built in recent years have equipment to shorten the time of charging, vacuum charging equipment, equalizer mains, and self-sealing doors to minimize emissions. But older ovens do not lend themselves to the addition of such protective equipment.

Blast furnaces emit about 150,000 cubic feet of gas per ton of iron. With protective devices added to the furnaces, their gases contain less than 10 pounds of dust per ton. Dust catching equipment now used includes gas bleeders, venturi and orifice scrubbers, and electrostatic precipitators. One company spent \$3 million equipping four blast furnaces with precipitators and \$200,000 for gas bleeders. Another spent \$700,000 equipping two furnaces for high top pressure and installing venturi-type wet washers.

The effluent from open-hearth furnaces is the

industry's biggest and most persistent source of pollution. The United States has 926 openhearth furnaces, representing 88 percent of the industry's steelmaking capacity. About half the dust from an open-hearth furnace is less than a micron in size and mechanical cleaners do not eliminate it effectively. Precipitators, high energy scrubbers, or filters may be required.

Four installations presently operating effective open-hearth gas-cleaning use waste-heat boilers to reduce gas temperature and electrostatic precipitators to do the cleaning. The initial installation was trouble free, but the three subsequent ones required modifications. Precipitation of dust from an open-hearth furnace still appears to be more of an art than a science.

One company equipped nine open-hearth furnaces with electrostatic precipitators at a cost of \$5.5 million. Another spent more than \$7 million adding automatic fuel and combustion control equipment to 41 open-hearth furnaces.

The new basic oxygen steelmaking process requires special equipment to suppress effluent. Spark traps and wet washers followed by moisture eliminators installed in a new 1-millionton capacity plant cost \$2.2 million. Other companies use dry electrostatic precipitators to clean gases.

The most popular type of air-cleaning device on electric furnaces is, in effect, a giant vacuum cleaner. Dust is collected in 15-foot bags in a baghouse as the air passes through them. The bags are shaken vigorously and the dust falls into a hopper where it is mixed with water to form sludge. This type of installation, which can also be used in the basic oxygen process, is highly efficient.

Many other operations of the steel industry employ devices to reduce air pollution. Some examples are electrostatic precipitators in boiler houses, water sprays on car dumpers at ore- and coal-handling facilities, cyclone cleaners and water sprays in sinter plants, scrubbers on coal pulverizers and coal washers, waste gas controls at soaking pits, and cyclone dust catchers, electrostatic precipitators, and wet washers on scarfing beds and scarfing machines.

There is much research in progress. Old problems remain and new ones will arise. The

steel industry will attempt to solve them as speedily as possible.

Chemical Industry

For the chemical industry, the avoidance of air pollution and the proper use of air are conditions of doing business. Chemical producers know that many of the substances they use or produce are hazardous, and that safety of employees, neighbors, and customers must be a primary consideration. This concern undoubtedly accounts for the fact that the chemical industry has one of the best safety records in the world.

Avoidance of air pollution begins in the laboratory with the development of a process and continues through plant and process design, operation, and maintenance. A survey of the engineering departments of a representative group of companies revealed that the lowest estimate of the cost of air pollution control or avoidance is from 1 to 1½ percent of all production costs, including amortization of investment in equipment, operation, and maintenance and excluding the cost of research. We can conservatively estimate that the chemical industry spends \$200–\$250 million a year for the control or avoidance of air pollution.

The development of new processes is one of the key factors in the industry's successful attack on air pollution. Ours is a highly competitive business and efforts to develop new and more efficient processes are continuous. Since the investment in pollution control equipment and the cost of its maintenance are frequently so high, chemical engineers seek to eliminate the need for such expenditures. Of course there are continuing efforts to improve control in older processes and operations which still have useful life, and it is necessary to design, install, and operate control equipment in new processes if the process itself cannot avoid generation of pollution.

I do not mean to imply, however, that the problem is not still very much with us. We feel

and education. If only because of the knowhow we have gained we have an obligation to help end air pollution not directly connected with the production of chemicals. We also have an obligation to help regulatory officials and legislators draw up and administer laws and regulations that are workable and realistically in the public interest.

The industry, through the Manufacturing

we must continue extensive work in research

The industry, through the Manufacturing Chemists' Association, has conducted workshops and conferences for people in the industry and for regulatory officials. Among its published works is the "Air Pollution Abatement Manual," a definitive compendium, kept up to date by frequent supplements. Another booklet, "A Rational Approach to Air Pollution Legislation," sets out recommended principles to be used in drafting air pollution legislation. The association also makes available experts in air pollution control to help prepare legislation or regulations and cooperates actively with government and private research agencies.

Scientific investigation probably offers the best hope for sensible and effective control of air pollution. But air pollution cannot be solved without honest, accurate public understanding; here we have been less successful. Our responsibility is not only to do the best we can to avoid air pollution but also to be honest and forthright in these matters in dealing with the public. Objective reporting, based on full scientific knowledge and understandable conclusions, is the only kind that will assist in making real progress.

Florida Phosphate Industry

brief

Industry needs to intensify its research in air pollution and in control efforts. It must also inform the public of its achievements to gain an understanding ally.

This has been the experience of the phosphate industry in Florida where a pattern of industry-

Based on a paper by Howard F. Roderick, vice president, Phosphate Chemicals Division, International Minerals and Chemical Corp., Chicago.

Based on a paper by Gen. John E. Hull, USA (Retired), president, Manufacturing Chemists' Association, Inc., Washington, D.C.

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community cooperation emerged after a period marked by complaints and damage suits.

Supplying 70 percent of the Nation's output of phosphate, growing citrus fruit, and raising cattle are the principal activities in Polk County in central Florida. The phosphate rock, which contains 2 to 3 percent fluorine, is strip mined, piped in slurry to refineries where it is dried and processed, and shipped in various forms. Cyclone collectors, precipitators, and bag collectors are used to collect the dust raised during drying and handling.

Recently the production of triple superphosphate, a highly concentrated fertilizer, has increased so rapidly that the State is now responsible for 80 percent of the Nation's output.

As the population of the county grew in step with the increase in the production of phosphates, complaints about air pollution multiplied. Citrus growers and flower growers complained about fluorine damage to crops and cattle raisers about fluorosis in cattle.

In 1955 the Florida State Legislature created a joint committee on air pollution to conduct hearings. Two years later a State law created an Air Pollution Commission. By this time several damage suits had been filed against the phosphate companies.

The phosphate producers in Polk County took no joint action until 1955, although they had invested an estimated \$6 million in effluent control equipment. My firm, International Minerals and Chemical Corp., began control measures when its plants started operating, and, by July 1959, will have spent more than \$3 million on modern waste control equipment which costs \$250,000 a year to operate.

Our research laboratory also did leaf sampling and evaluation studies to determine the cause and nature of alleged crop damage. We later found that these were pioneer studies of air pollution damage to citrus crops.

However, the mineral producers in Florida failed to recognize that the public blamed the entire industry for the air pollution and ignored a single company's efforts at control. The industry also failed to keep the public informed of the work that had been done.

Both failures have now been remedied. A Florida Phosphate Producers' Committee, formed initially to represent the six participat-

ing members at the hearings of the State legislative committee, has become a permanent organization.

It has two purposes. The first is to conduct expert, impartial scientific research into the causes and effects of air pollution in Polk County. A Washington firm, retained to do this job, has set up a field laboratory and is conducting extensive studies in the county.

The second purpose is to inform the public about the industry. A local public relations agency was hired to counsel and direct public information activities for the producers. Interviews with researchers and stories about the research work, control activities, and the industry's economic importance to the community have gained greater public understanding of the difficulties of solving air pollution.

While the final outcome of these actions is yet to be judged, I think the interim results are significant. They indicate that industry will participate in a soundly directed search for the facts concerning air pollution.

Economic Aspects

brief

Losses from air pollution in the United States are estimated at \$3 to \$4 billion annually. About \$300 million is spent for control each year.

These figures may not be completely accurate, but they indicate the magnitude of the economic problem.

Air pollution control has grown from consideration of smoke and fly ash to encompass the total environment. Similarly, experts concerned with improving the air have developed their skills. They now have professional standing and use portions of several academic disciplines in their work. The education of such technical personnel has only begun, but it has already made possible an increasing body of research and know-how that has solved many complex control problems.

But educating industry and the general pub-

Based on a paper by William R. Bradley, M.S., assistant director of environmental health, central medical department, American Cyanamid Co., New York City.

lic to evaluate realistically their air pollution potential has not kept pace with the training of professional personnel. General application of present knowledge is lacking. It is time that the economic benefits and burdens of control for both industry and the public are understood and appreciated.

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Industry has sponsored many educational programs in pollution abatement. Such voluntary efforts in self-education and the work of scientific organizations have prompted the spending of large sums for research. The majority of industries have demonstrated their cooperation in efforts to obtain cleaner air and consider that properly constituted and fairly administered control legislation will serve as a spur to the recalcitrant. But the general public has not taken comparable steps in self-education. Certainly, complaints have outstripped the development of an understanding of the economic and social benefits deriving abatement.

For example, many people realize that burning household rubbish and wastes in open dumps causes smoke and odor and creates a breeding place for rodents and insects. But the cost of proper incineration facilities for a municipality is staggering to them and they do not always vote funds for such facilities.

Many municipalities do not realize that the cost of garbage and refuse disposal in a sanitary landfill is approximately one-third the cost of operating proper incineration equipment. In some areas a sanitary landfill can convert marginal land into parks or industrial sites that will eventually pay their own way.

The public contributes to air pollution by its use of automobiles, heating fuel, and backyard incinerators. An informed public can help to eliminate contaminants. We know the facts about abatement, but what is the best way to disseminate them? How soon the public insists on more economical disposal of these wastes depends largely on how effectively it is informed.

Savings in Industry

Industry can best be approached by making it aware of the economy that accrues when control is planned in the blueprint stage of a new plant. Today most dollars spent on control and equipment are written off as part of the cost of doing business. But there is a trend for increasing returns from dollars spent on control. Industry's resourcefulness has made many control installations profitable through the recovery of usable byproducts.

One plant installed a steam stripper to remove volatile benzothiazole that caused a neighborhood nuisance. The steam stripper cost approximately \$85,000; the benzothiazole recovered annually is worth about \$50,000.

The baking ovens in an enamel coating metal strip operation gave off pungent solvent fumes. Installing a catalytic oxidation unit to burn these fumes saved considerable fuel, increased production 400 percent, and lowered insurance rates 95 percent. The \$30,000 investment has more than paid for itself and in addition has gained the priceless commodity of neighborhood goodwill.

Detroit-Edison, which burns about 5.5 million tons of coal a year, has created a market for fly ash. It reacts with lime to form a durable, cementlike substance and in 1957 the company sold 105,000 tons, at \$1 a ton. Dumping the fly ash would have cost the company \$78,000. Fly ash is now used in ready-mix concrete, building blocks, slag and clay bricks, roadbase choking material, filtering media, metal polish agents, and mild abrasives, and for sand blasting and land-fill reclamation. An old liability is becoming a new asset.

A mineral processing company spent \$8,000 to install equipment to collect fines lost in grinding operations. The company hoped to write off the expenditure in 2 years, but the recovered dust was of such exceptional quality it brought \$5 a ton more than the original product. The control process grosses about \$25,000 a year.

An alfalfa mill owner learned that the cattle he grazed behind his elevators preferred alfalfa fines to their usual hay and molasses. Tests revealed the fines' protein content was higher than the regular product. Dust collection is now earning its own way.

Despite what has been accomplished, byproduct recovery and development is only in its infancy and large economic rewards from abatement are yet to be realized. From industry's dollars spent on research in abatement will come the solution of many problems for industry and for the general public.

Goals

Our goals for the future might be:

- A program to expand the education of more personnel in the profession of air pollution abatement.
- A program to inform industry and the general public of the economic benefits abatement makes possible.
- Establishment of a center to collect and disseminate existing know-how concerning abatement.
- Channeling of research funds into studies of byproduct recovery and development processes and of less expensive abatement techniques.
- Establishment of liaison between government and industry that will break down restraints or fears of punitive measures and replace suspicion with cooperation.
- Creation of a team approach between the public and industry toward cooperative responsibility and effort in abatement.

These goals, while long range in scope, can be inaugurated today so that dividends of cleaner air, mutual trust and understanding through education, and a desirable economy eventually will accrue.

Levels of Responsibility

brief

The constitutional basis for control of air pollution rests with the police power of the States. Under the Constitution this power of the States includes the power to protect the health, welfare, safety, and general welfare of their inhabitants. While the police power is limited by the 14th amendment, if legislation regulating air pollution is reasonably necessary for the public welfare, it will be interpreted as a valid exercise of this power.

Nor is such legislation invalid because it might put someone out of business or require a large expenditure of money. (Northwestern

Based on a paper by Harold W. Kennedy, county counsel for Los Angeles County, Calif.

Laundry v. Des Moines, 239 U.S. 486, 36 S. Ct. 206, 60 L. Ed. 396).

Whether it is feasible for the State to take an active part in air pollution control depends on the locality. In 1947 California adopted a statewide statute but left actual enforcement to local air pollution control districts on the county level. This type of enabling act has since been adopted by Kentucky, New Jersey, Massachusetts, Oregon, Washington, Delaware, New York, and Florida.

The purpose of such State laws is to maintain a reasonable degree of purity of the air resources consistent with public health and welfare. Air pollution is generally defined as the presence in the air of contaminants, put there by man, in quantities and of a duration to cause discomfort to a substantial number of citizens, or which are injurious to human, plant, or animal life or property. Standards for quality and quantity of pollutants and the framework for enforcement are usually included.

The California act provides for an air pollution control district in each county to be activated only if the county board of supervisors finds that local ordinances cannot handle air pollution adequately. The board of supervisors, sitting as an air pollution control board, is vested with power to make all regulations necessary to accomplish control or abatement, or both. An air pollution control officer appointed by the board is empowered to enforce the regulations as well as the State law.

These statutes are admirably suited to a one-county problem. However, California's basic act was amended to permit counties, by appropriate action, to merge or consolidate into an overall air pollution control district. In 1955 a district comprising nine counties in the San Francisco Bay area was created by special action of the California legislature.

That year California also recognized a state-wide responsibility to supplement local activity in research. The State health and safety code now provides that the State department of public health shall maintain an air sanitation program which includes study of health effects of air pollution, determination of physiological effects of air pollution on plant and animal life, determination of factors responsible for air pollution, monitoring of air pollution, de-

velopment of administrative means of control of air pollution in emergencies, and assistance to local agencies in effectuating all of these activities.

Delaware and Oregon have gone beyond the enabling act at the State level. Both have a statewide air pollution control body to make rules and regulations and provide machinery for statewide enforcement. Oregon's regulations also encourage local control programs wherever feasible.

States vary in the responsibility that they have accepted for air pollution control. Some leave the matter completely to local authorities. Most States with economies substantially dependent on heavy industry have accepted responsibility for providing enabling acts, encouraging local control programs, and creating standards by which local programs may operate.

Local Programs

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Recently it was estimated that 9,500 communities in the United States had air pollution problems, but only 2,050 had adopted any legislation aimed at control. Doubtless only a small minority have enacted comprehensive programs, yet local ordinances account for 80 percent of the control programs in the Nation today.

Air pollution legislation is one of two general types or a combination of them: mere punitive ordinances setting degrees of penalties for violation of laws and regulatory ordinances whose object is abatement by prevention of the discharge of pollutants into the atmosphere. Punitive ordinances were relied upon for years, but those which attack the situation at its source are now favored.

New York City, Baltimore, Richmond, Va., and East Chicago, Ind., have recently adopted comprehensive codes including permits and inspection procedures. Because air pollution is not confined by a city's boundaries, Los Angeles and Cincinnati found it necessary to make compacts with nearby communities for cooperative control measures.

An alternative solution to such a problem is to seek State legislation providing for the creation of an air pollution control district at a higher political level than the individual city or county. The California statute provides for such districts in each county or combination of counties.

It must be recognized that any sound program of air pollution control must be tailored to the area. Size, population, industries, nature and extent of the pollution, and the funds available must be considered. Within the local programs there may also be separate levels of responsibility for rulemaking, enforcement, hearing and deciding individual cases, and an advisory function.

The primary responsibility for administration of an effective control program rests upon local authorities in most instances, but if the local authority is too small in relation to the size of the problem, it will fail unless it receives cooperation from its neighbors or assistance from some superior governmental agency.

Regional and Federal Action

If the effects of contaminants transcend the boundaries of a particular State, no solution is possible without Federal control or an interstate compact. The Constitution states, "No State shall, without the Consent of Congress . . . enter into any agreement or Compact with another State. . . ." The courts have held that this consent may be given after as well as before the agreement between States is made. (State v. Joslin, 116 Kan. 615, 227 Pac. 543). Since serious air contamination is seldom solved without enforcing laws, adequate control for adjoining industrial areas in separate States must contemplate some form of regional control.

Although the control of air pollution is not among the powers explicitly given to the National Government by the Constitution, neither is the protection of public health nor the prevention of pollution in streams. However, Congress has legislated to accomplish both these aims.

The commerce clause of the Constitution would be the most reasonable provision upon which to base the control aspects of a national program of air pollution control. Essential to the use of the commerce power is that the subject of the legislation or something closely related to it crosses State lines.

Also, Public Law 159 expressly affirmed "The policy of Congress to preserve and protect the primary responsibilities and rights of States and local governments in controlling air pollution, to support and aid technical research to devise and develop methods of abating such pollution, and to provide Federal technical services and financial aid to State and local governments, air pollution control agencies, and other public and private institutions in the formulation and execution of their air pollution abatement research program. . . ."

As the contamination of our atmosphere increases in intensity, it is obvious that the various levels of government must assume additional burdens to end the threat to a basic natural resource, the air we breathe.

Adequate Monitoring

There is no simple formula for the right amount of air monitoring in a given community at a given time. The optimum level of monitoring is the balance between the need for information on the state of the air and the cost of obtaining information. Inadequate monitoring could permit another Donora to occur, but superfluous and ill-planned monitoring is a serious, expensive waste.

In this paper, monitoring is defined as continuous routine measurements of air quality as distinguished from a small number of samples taken for research. Pollen counts and radiological measurements are not considered.

An estimated \$1.5 million a year is now spent on monitoring in the United States. About 10,000 communities are said to have some sort of difficulty with air pollution.

The Register of Air Pollution Analyses, published by the Public Health Service, includes all known sources of monitoring, excluding that done by industry for its own protection, up to January 1, 1956. It lists 194 communities in which measurements were made. These were

Based on a paper by James P. Lodge, Ph.D., chief, Chemical Research and Development, Air Pollution Engineering Research, Robert A. Taft Sanitary Engineering Center, Public Health Service, Cincinnati.

located in 30 States, the District of Columbia, and Hawaii. The Register also shows that 150 urban areas measured some aspect of particulate pollution, 81 measured gaseous pollutants, and 40 had data, not always simultaneous, for both gases and particulates.

Although the passage in 1955 of Public Law 159, the Air Pollution Control Act, undoubtedly increased activity, it seems unlikely that more than 400 cities now conduct monitoring. However, continual sampling and analysis of the air of 10,000 communities may constitute, both scientifically and economically, too much

monitoring.

Monitoring has four functions: to signal the existence of pollution, to identify sources, to indicate trends, and to warn of air pollution emergencies. By its nature, monitoring is somewhat inflexible in the amount of information it yields and is often less suited to the needs of a community than spot sampling and analysis. The overall complex of pollution-malodors, excessive dust, smarting eyes, and decreased visibility—is easily detected, and monitoring can only confirm what is already known: that pollution exists.

Data obtained by air analyses can yield information on the sources of pollution. However, a clever scientist should be able to find most sources of pollution in a few days of suitable weather. It is futile to perform analyses year after year to show pollution from a given source if nothing is done to control emissions.

Monitoring can yield information about the trends in the concentration of pollutants. However, consider an actual case, a small town deluged with ashes from a sawdust incinerator. The source was detected in a few months' work, and after controls were installed on the incinerator, dustfall was reduced 90 percent. Are continuing analyses necessary?

Monitoring as a warning of a disaster caused by pollution is necessary if there is a reasonable probability of disaster. But what is a "reasonable probability?" A few years of monitoring can indicate the numerical probability of a given concentration of pollutants, but are fullscale analyses justified for a warning which will be sounded once a century?

Probably the occurrence of dangerous levels once every 10 years, or good evidence of increases in pollution toward these levels, make a warning system defensible. But perhaps only a single substance needs to be monitored.

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The principal justification for monitoring, then, must be the determination of trends in air pollution in cases so complex that trends are not obvious. Any other information from monitoring operations must be regarded as a byproduct.

However, if present monitoring programs are measured against these four functions, they must be considered inadequate. Some areas are overmonitored or wrongly monitored, or both, and many communities with serious and complex problems lack facilities for even the most cursory examination.

In many situations, routine measurements of air quality over a finite period, such as a year, to establish base levels can serve very well. The levels may then be compared with subsequent spot measurements.

Consequently, we should examine the existing routine analyses, define their aims, and see if they are the best and most economical method of achieving these aims. We need to determine where monitoring is actually required. And we need research to produce the analytical methods and tools that will make monitoring less expensive and to devise control equipment that decreases emissions to the atmosphere.

A Rational Approach

brief

The rational approach to control of atmospheric pollution in any specific area is based on two precepts: reasonable use of the atmosphere for the disposal of airborne waste materials and sufficient control of pollution to prevent a nuisance or a detrimental effect on health or property.

In developing criteria for the application of control equipment and techniques, the nature and scope of the pollution must be clearly understood. Air pollution is generally complex because of variations in the character of the contaminants, the diversity and intermingling of industrial and community sources of pollution, and the influences of topography and weather on its distribution and concentration.

Difficulties also arise from variations in the effects of contaminants on man, animals, vegetation, and property. These effects may be experienced in only a small area near the source or over an entire region.

The majority of foreign substances discharged to the atmosphere by the activities of man combine in effect to produce contaminants which are classified as aerosols or gases. Aerosols are the solid and liquid particles generated by combustion, mechanical action, and chemical reaction. They reduce visibility, cause damage to property and to vegetation, injury to animals, and, to an unknown extent (at least at present), affect the health of man. Gaseous contaminants are believed to be significant in relation to effects on health and damage to property and vegetation, and as nuisances.

Sources of pollution tend to be grouped at centers of population, and thus to be concentrated within a given area, but topographic and meteorologic factors may cause the pollutants to be widely dispersed.

A cursory examination of the air pollution problem would favor establishment of universal concentration limits at the source. But such an approach is invalid both technically and economically since it would require all areas to meet the degree of control required for the most susceptible area. Furthermore, the concentration of pollutants at the source is not an acceptable measure of the effects.

However, a baseline limit above which pollution concentration is not tolerable under any conditions should be set. Two factors must be considered in setting such a limit. One, the degree of control for any single source must be such as to prevent obvious damage to property and vegetation, obvious injury to animals, and obvious detriment to health. Two, the limit established for each industry must prevent the combined sources within the area from causing serious damage to property and vegetation, serious injury to animals, and any detriment to health under the most adverse weather conditions. The maximum limits of tolerance must

Based on a paper by Andrew H. Rose, Jr., chief of engineering research and development, Air Pollution Engineering Research Program, Robert A. Taft Sanitary Engineering Center, Cincinnati.

be continually revised on the basis of new knowledge or changes in the affected area.

The engineering approach is to limit pollutants at the source so that the combined concentration from all sources in the environment will not be detrimental to health and property or cause nuisances, while allowing the atmosphere to function as an acceptor of emitted waste.

A high degree of control at the source is not always feasible within the economic capabilities of the specific area. It must be recognized that the costs of source control are borne indirectly by society but that the costs of the effects of air pollution in the environment are borne directly. Successful application of control at the source must therefore depend on the sagacity of a compromise between the cost and the desired end.

Citizen Participation

brief

In the past 6 years, Philadelphia has developed a practical program of air pollution control by involving the community in basic policy decisions. Experience has convinced us that lay participation in planning control measures is healthy, sound, and one of the best ways to explore and use community sentiment.

Philadelphia's Home Rule Charter, adopted in 1951, directed the Air Pollution Control Board, an 8-man advisory body to the health department, to prepare a comprehensive code for submission to the city council. The legislative base for public health laws rested on miscellaneous municipal ordinances, some dating back to the 19th century. The Air Pollution Control Code, adopted in 1954, grew out of this mandate to review, consolidate, and improve the city's ordinances. Specific regulations were later appended to the code.

Community participation began with the drafting of the code, which was thoroughly reviewed by industry and the lay public in the course of its adoption. Primary assistance came from the chamber of commerce and civic organizations.

Based on a paper by Donald C. Wagner, managing director, City of Philadelphia.

We found that using adequate community representation to help draft the code and regulations avoided many later difficulties. Such representation provided the administrator with a means of educating key members of the community as well as giving him a sense of what the citizen expected from the proposed legislation.

Adequate representation also led to an accommodation of conflicting points of view. Later when the proposed legislation was discussed at public hearings, members of the community as well as the administrator and the legislator defended its validity, fairness, and reasonableness.

When the regulations went into effect, the industries which had participated in the drafting were, if not enthusiastic, at least well informed about them, and the individual attitudes that industry's representatives displayed in advisory committee meetings had already been softened in group discussion. Finally, citizens' participation made available to the city the best talent in the community, talent which, ordinarily, could not be purchased.

Two examples of our methods follow. Open burning at dumps and auto wrecking yards was ended January 1, 1958, in Philadelphia. While the city was still involved in a legal battle over the ban on burning refuse, an advisory committee began writing regulations for sanitary landfill, which would replace burning as a means of disposal.

The committee included the operator of a dump, an attorney who was contesting the ban, a professor of civil engineering, a person experienced in city planning, the engineer in charge of the municipal incinerator, a member of the chamber of commerce, and two citizens who were familiar with the advantages of various methods of refuse disposal. Despite some strongly antithetical points of view, the members drew up a set of regulations that were in the public interest and later were unopposed at public hearings.

In investigating rendering plants, the staff of the air pollution control section found that the general insanitary conditions as well as the plant odors necessitated a comprehensive approach.

The staff drafted regulations that they considered ideal, and a 15-member advisory com-

mittee reviewed them before appointing a subcommittee to work on them. The latter group included the owner of a rendering plant, an attorney representing the industry, an industrial physician, an official of the union that represented workers in the industry, and a veterinarian. They reviewed the draft and recommended changes and additions.

Their draft was again reviewed by the parent committee, inspected by the board of health, the top-level citizens advisory body, and the Air Pollution Control Board. This process, if somewhat prolonged, resulted in regulations that satisfied staff and industry and that were uncontested in public hearings.

Such procedures have worked in Philadelphia. For some reason, the logical processes of a group differ substantially from the thinking of the individual persons in the group. Each person is willing, or forced by the dynamics of

the situation, to abandon some personal interest in favor of a solution satisfactory to all.

We have also found that if an agency expects assistance from industry, the agency must be ready to reciprocate by acting as a consultant in air pollution control. Because of its contacts and experience, the agency is often able to point out pitfalls and indicate methods of control that have succeeded previously. The agency's function as consultant thus aids in preventing air pollution and eases its task of enforcing regulations.

As evidence of the success of these methods, in the past 6 years we have eliminated open burning on dumps, initiated a multimillion-dollar incinerator system, abolished coal-burning engines and industrial smokestack nuisances, and guided industries in installing major control facilities. The air in Philadelphia is measurably improved.

Status of Fluoridation in Community Water Supplies

By the end of 1958, 1,778 communities, supplied by 960 water systems, had adopted the procedure of adjusting the fluoride content of their drinking water. This represents a gain for the year of 4.2 percent in the population protected by controlled fluoridation.

During 1958, 145 communities with a total population of 1,449,155 adopted fluoridation. These places include Mobile, Ala., Peoria, Ill., Atlantic City, N.J., and 142 smaller cities and towns scattered throughout the United States. During the year, two communities with 15,000 persons discontinued fluoridation, the smallest number to suspend fluoridation in any year since 1951.

The communities which adopted fluoridation during 1958 include 9 cities with populations of 25,000 to 250,000, 96 communities with populations of 2,500 to 25,000, and 46 towns with populations of less than 2,500.

It is estimated that approximately 118 million people are using water from community sources. Of this number 35,240,000, or about 30 percent, are drinking water with controlled fluoride concentrations which provide optimum protection for preventing dental caries. In addition, about 7 million people obtain drinking water from community sources which naturally contain the recommended fluoride concentrations.

British Caribbean Water Supply

EDWARD W. MOORE

ALTHOUGH the geography, geology, and meteorology of the British Caribbean territories vary so much that generalizations cannot be made about the quantity and quality of their water supplies, there are some common administrative problems relating to these supplies.

The territories to which I refer consist of British Guiana and the newly created West Indian Federation, which comprises Trinidad, Jamaica, Barbados, and the Leeward and Windward Islands. The federation represents a land area of 8,000 square miles, containing a population of about 3½ million. British Guiana has 83,000 square miles and less than a half million population.

One of the common problems of these territories is lack of sufficient money with which to develop waterworks that would approach United States standards in quantity and quality. Only the larger territories, such as Jamaica, with its bauxite, Trinidad, with its

oil and asphalt, British Guiana, with its bauxite and timber, and Barbados, with its rum and profitable tourist trade, appear to be exceptions. The smaller, primarily agricultural islands have to sacrifice both quantity and quality to a dangerous degree.

A second problem, which tends to exaggerate the effect of the first, is the nearly complete absence of a technically educated, subprofessional group to serve as operating, maintenance, and clerical staff. The load placed on the well-trained engineers at the top, as a result of the situation, is appalling, particularly in the smaller islands. It is not unusual to find one man responsible for roads, docks, waterworks, airfield construction, and erection of power stations. These responsibilities might not be too burdensome were it possible to delegate details to subordinates, but in many situations this is either impossible or inadvisable.

Standards of operation of the waterworks were observed to be low, with some notable exceptions in the larger islands where industry has created a market for and consequently a supply of subprofessional technicians. Most of their training is on the job, for almost no adequate trade schools or technical high schools exist. Maintenance of plant and equipment is particularly difficult under these circumstances. Many well-designed water systems cease to operate properly not long after completion.

The third problem relates to the very peculiar attitude toward wasting water which was encountered in all areas except one. Very few supplies (and these only partially) are metered. The proportion wasted is certainly very high, although it is not possible to get figures.

In general, the waterworks engineers seem

Mr. Moore, who is a lecturer on sanitary engineering at Harvard University, presented this paper in slightly different form before the Committee on Sanitation and Environment, Division of Medical Sciences, National Academy of Sciences-National Research Council, on October 7, 1958. His remarks are based on observations recorded when he and Prof. George T. Bryant of the Johns Hopkins University conducted a refresher course for waterworks engineers in the British Caribbean territories. The course, which ran from March 17 to June 6, 1958, was sponsored by the Pan American Sanitary Bureau, Regional Office of the World Health Organization, in cooperation with the government of Trinidad and Tobago.

apathetic about wastage. In many cases, the result is periodic failure of the water supply. In Port of Spain, Trinidad, which is a modern city in other respects, the mains in certain areas were empty a large part of every day during the time I stayed there. From time to time, rather feeble educational campaigns are attempted, but without apparent success. Newly instituted education in water conservation in the primary schools may have more effect.

An Apathetic Public

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Public disinterest in water waste appears to be partly due to the special nature of the local water systems. All rural areas, and even the villages and smaller communities, are served by mains bearing public taps ("standpipes") to which all inhabitants come for water. Piped water in houses is rare outside the strictly urban regions. Control of waste at public taps is difficult if not impossible. One never takes a trip in the country without seeing a few taps leaking badly or left open. Consequently, the city user, with water piped into his place of residence or business, can see no reason for bearing the cost of metering, or the onus of conservation, when his rural brother does what he likes without reprisal.

The outstanding exception to the general rule of apathy to water waste is Antigua, the driest of the islands. At the height of an extreme drought several years ago, potable water is reputed to have sold for as much as \$1 (BWI) a gallon. Such severe conditions developed a public intolerance for water waste, and even the public taps are now metered.

Impoundment and Turbidity

Trinidad, with plenty of rainfall in its mountainous areas, has the problem of making suitable impoundments in very rugged terrain. When impounded, water in the zone of stagnation becomes foul because of the constant warm weather. Although there are no overturns due to fluctuations in temperature, a sudden heavy rainfall may roll over the water in the reservoir by driving a wedge of cool water under the bottom layer. Reservoirs are usually equipped with drainage gates at very low levels so that

the foul bottom water can be drawn off when heavy rain is expected. Wells in the central part of the island are high in iron and require deferrization, but conventional methods are adequate.

Georgetown, British Guiana, located in an extremely water-rich area, treats a unique type of water in its filtration plant. Entering the plant with a pH value in the low 5's and color ranging above 400 units, this "black" water from the Lamaha Canal is converted into a water of normal pH value, with color not greater than 15 or 20 units. This is accomplished by liberal doses of alum and sodium aluminate (about 1 ton of alum per day for 5 m.g.d., and about onethird as much aluminate), and two stages of sedimentation. It is undoubtedly the only waterworks in the world in which manatees are deliberately placed in its open secondary sedimentation tanks to keep down growth of vegetation.

Other areas encounter problems of very high turbidities. Kingston, Jamaica, treats turbidities, which may run occasionally as high as 5,000 units, in a conventional rapid sand filtration plant, with air-scour equipped filters. Alum doses run as high as 3½ grains per gallon. It also treats similar waters in an old but handsome slow sand filter plant by means of primary settling tanks that could well serve as yacht basins.

On Other Islands

The small, dry island of Antigua is a waterworks man's nightmare and a geologist's paradise. The northern section of this 12- by 15mile island is limestone, yielding a niggardly quantity of very hard water. The central section is marine chert, yielding water of such high salinity as to be useless. The southern section, which is volcanic and mountainous, receives most of the small, poorly distributed rainfall and is used as the main impoundment area. Turbidities are very high, and there are no adequate filtration plants. Wells and infiltration galleries are also used in this area. It is one of the few places where a comprehensive plan for developing water resources exists, but the question of financing the plan remains unanswered.

For more than 300 years, Barbados has been emptying its wastes into one set of holes in its coralline base and drawing its water from another set. No major outbreaks of waterborne disease have been recorded, and the island is rather proud of the quality of its water. However, both the rate of draft of water and the rate at which wastes are disposed of in the so-called "suck-wells" are increasing rapidly. No one knows how long such practices can safely continue. Fortunately, the health authorities are aware of the problem and are maintaining a close watch.

Each of the other islands has its own prob-

lems of water quantity and quality and engineering difficulties in bringing water to the point of use. Heads of several hundred or a thousand feet, which have to be eliminated at pressure-break tanks along the pipelines, are commonplace.

A full presentation of the many water problems of each island is impossible in this brief report, but enough has been said to indicate that the problems of quantity and quality of water in this attractive part of the world vary fully as much as they do in continental United States, except for the difficulties associated with cold weather.

The International Health Year

Plans for an International Health Year have gained momentum with a resolution adopted by the Executive Board of the World Health Organization asking the WHO Director-General to present specific projects for the Year to the World Health Assembly in May 1959. The resolution, taken in January 1959, favored emphasis on national undertakings to be coordinated on a regional and worldwide basis.

The action followed a U.S. Senate resolution, passed in August 1958, proposing talks with other nations on the designation of an international health and medical research year, "or other methods of developing intensive international cooperation in the field of health."

In December 1958, the United Nations General Assembly also passed a resolution inviting the World Health Organization to consider organizing the Year primarily on a national basis. The purposes outlined were the spread of medical knowledge, furthering of joint scientific research, exchange of experience in the use of atomic energy in medicine, organization of mass health education on a broad scale, and provision of assistance to underdeveloped countries, including equipment, medicine, special literature, and specialists.

In anticipation that the Twelfth World Health Assembly will act favorably on the proposal, Surgeon General Leroy E. Burney has appointed an ad hoc committee to consider participation of the United States in the Year and to discuss the feasibility of establishing a national committee on the International Health and Medical Research Year. The group, which met on May 6, 1959, includes representatives of both governmental and private agencies in the health and medical

fields.

A special medium extends the viability of organisms in swab specimens during prolonged transport time from the patient to Alberta's central public health laboratory, which serves an area of about 200,000 square miles.

Transport Medium for Specimens in Public Health Bacteriology

R. D. STUART, M.D., D.P.H.

DELAY during the transmission of specimens from source to laboratory most noticeably affects delicate organisms which survive poorly over a period of 24 to 48 hours. Such organisms are Neisseria gonorrhoeae, Haemophilus pertussis, and Trichomonas vaginalis, and also Shigella species when specimens are obtained on rectal swabs. The pyogenic cocci common in throat inflammation and superficial infection are usually more resistant but may be significantly affected if few in number or if transport time is prolonged. Such conditions can readily arise during epidemiological investigation carried out in remote areas.

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The problem has been variously tackled in the past. Two major devices have been employed. First, cooling or freezing, which slows normal bacterial metabolism, has been used to extend viability and at the same time to diminish bacterial competition. Second, transport on culture media has been employed to increase viability by encouraging multiplication, but this necessitates selective agents to limit bacterial competition. Both these methods have significant disadvantages. Methods of chilling or freezing are troublesome in initial application and add considerable additional weight and cost during transport. Methods of transport in selective culture media demand a medium appropriate to each bacterial pathogen and are limited by the availability of specific selective agents which will work equally well under a variety of environmental influences and over a greatly variable time period. Such agents do not exist for most bacteria.

A transport medium must be simple in clinical use, easy in laboratory manipulation, cheap, and of wide applicability.

The transport medium to be described has all these virtues. Introduced by Stuart (1) primarily for the transport of swabs for gonococcal culture, it was applied by Moffett, Young, and Stuart (2) to the investigation of similar material from clinics mostly within 24-hour transport distance, and later by Stuart, Toshach, and Patsula (3) to the greater transport distances found in Alberta. Its value for this purpose has been confirmed by L. LeMinor, S. LeMinor, and Combes (4) from the Pasteur Institute, Paris, France; by Wilkinson (5), from the Whitechapel Clinic, London, England; by Alin (6), from the State Public Health Laboratory, Sweden; and by DeBoynton (7), Los Angeles County Health Depart-

Dr. Stuart is director of the Provincial Laboratories, Alberta (Canada) Department of Health, and professor of bacteriology, University of Alberta, Edmonton. He presented this paper to the laboratory section of the 1958 combined meeting of the Canadian Public Health Association and the Western Branch of the American Public Health Association in Vancouver.

ment, Calif., but irregularities in performance have been detected by Cradock-Watson, Shooter, and Nicol (8).

Its coincidental value for the preservation of living trichomonads in similar material was emphasized by several of the above workers. Alexander (9), in Liverpool, England, emphasized its general value for gynecological specimens. The applicability of this transport medium to other bacteria was indicated first by Stuart (10), who dealt particularly with meningococci and Shigella species and gave some preliminary information on the satisfactory transmission of H. pertussis and other respiratory pathogens. Cooper (11), in Australia, produced ample evidence to indicate the value of this transport method for all respiratory and other pathogens examined, while Stokes (12) emphasized its value in the transmission of anaerobic bacteria to a central reference laboratory. Many public health laboratories across Canada now use the method routinely for all bacterial infections when specimens have to be transported over considerable distances.

Rationale of Method

The transport method is based on two main premises explained more extensively in earlier work. Briefly these are, first, that oxidation is an important cause of bacterial death during transport and, second, that elimination of all nutrients from a transport medium is the simplest way of maintaining the bacterial status quo in specimens. Thus bacteria, if kept alive by the elimination of oxygen, remain in the same relative proportions in which they existed

in the original material from the patient. The applicability of these premises to all bacteria also obviates the necessity for using different transport culture media to suit different bacteria and makes unnecessary the frequently hopeless search for suitably specific bacteriostatic agents to control unwanted bacterial multiplication during transport. Simplicity of clinical application insures that the method is highly acceptable to physicians.

The transport medium is a soft water-agar gel, hard enough to prevent agitation during transport but soft enough to avoid cracking when a swab is pushed into it. Sodium thioglycolate was selected experimentally as the best reducing agent, but is used as thioglycolic acid, chiefly because measuring is simpler than weighing. Conversion to the sodium salt is achieved by adding NaOH to the medium, the pH being stabilized by a phosphate buffer. Calcium, as calcium chloride, was found decidedly beneficial, but its presence necessitated the use of glycerophosphate as a buffer. Calcium glycerophosphate is soluble to about 2 percent, whereas calcium phosphate is almost completely insoluble. A reduction indicator is considered desirable and methylene blue was found decidedly better than resazurin. Acid production by swab sticks and swabs is of occasional detrimental significance, but is eliminated by boiling them in buffer solution before issue. Of major importance, however, is the impregnation of these swabs with charcoal, the rationale of which has been fully described (3). This charcoal impregnation neutralizes an incompletely identified inhibitor of bacterial viability, regularly present in variable

Table 1. Results of parallel smear and culture examinations for gonorrhea in females

		Number of positives				Percent positive	
Year	Number of specimens	Total positive	Culture positive, smear positive	Culture positive, smear negative	Culture negative, smear positive	By culture	By smear
1952 1953 1954 1955 1956 1957	2, 546 2, 945 3, 039 3, 243 3, 513 5, 042	323 331 411 492 482 705	144 130 180 204 180 204	143 151 182 238 246 452	36 50 49 50 56 49	89 85 88 90 88 93	56 54 56 52 49

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Dissolve 6 gm. Bacto agar in 1,000 ml. chlorinefree distilled water. At the same time to another 900 ml. distilled water, add 2 ml. thioglycolic acid (Difco), 12-15 ml. $\frac{N}{1}$ NaOH (to bring to approximately pH 7.2; the amount is selected according to local experience to avoid as far as possible any final pH adjustment), 100 ml. solution of sodium glycerophosphate (commercial, 20 percent w/v in water), and 20 ml. solution of CaCl₂ (1 percent w/v in water). Add this mixture to the original melted agar. Check pH and if necessary adjust to pH 7.3-7.4. Add 4 ml. methylene blue (0.1 percent in water). Mix well and dispense in 1/4-oz. screwcapped bottles, filling to capacity. Screw caps on securely, but not tightly. Sterilize in flowing steam, avoiding overcrowding, for 1 hour. Tighten caps immediately following sterilization. After cooling, the transport medium should be colorless.

Note: Distillate from chlorinated water occasionally contains significant amounts of free chlorine. This must be checked rigorously. We pass all distilled water through an ion-exchange resin column before use. This water is used for all the above preparation work.

Swabs

Prepare neat swabs with good quality absorbent cotton and applicator sticks. Prepared swabs are boiled in Sorensen's phosphate buffer solution $\left(\frac{M}{15}\right)$ pH 7.4 (approximately 500 swabs standing in 100

ml. buffer in 1,000 ml. beaker, boiled 5 minutes). Remove, shake off excess moisture, then dip in a 1 percent suspension of finely powdered charcoal in water. We use activated charcoal (B.D.H.), but animal charcoal (Cenco), blood charcoal (B.D.H.) and Norit have been used successfully when powdered sufficiently fine. Swirl swabs around to coat thoroughly with charcoal (swabs should be quite black when wet). Shake off excess moisture, place in cotton-plugged tubes, dry in oven, and sterilize.

Instructions Sent With Outfits

Take the specimen and insert the swab or swabs into the upper third of the medium in the small bottle. Cut off the protruding portion of the swab stick with scissors and screw the lid on the bottle tightly. This usually forces the swab down slightly and centers it in the transport medium. Label the bottle and return it with the swabs enclosed to the laboratory as soon as possible. Keep specimens in refrigerator until ready for shipment.

The swabs are sterile. They have been treated with charcoal to improve the conditions for culture.

Laboratory Handling

Grasp the end of the short swab stick firmly with a long-shanked artery forceps and apply swab to culture media in the usual way. It is important that material from the swab itself is applied to the medium surface because adhering transport medium may be deposited on a culture plate and give a false impression of a satisfactory inoculum.

amount in all batches of agar so far examined. This inhibitor becomes of considerable significance because of the absence of protein nutrients in the transport medium.

A transport kit has been described by Stuart (10), and full instructions for its preparation and use are given above.

Application of Transport Method

Gonorrhea

Culture is essential in diagnosing gonorrhea only in females; thus consideration is restricted to cervical and urethral swabs from female patients. The two swabs from each patient are placed in the same transport bottle and are cultured together, generally on Peizer's medium prepared approximately as described by Trowbridge and McConkey (13) except that Difco supplement B is replaced by a locally prepared yeast extract. Colonies are identified when necessary by the oxidase reaction, and fermentation tests are carried out as a routine.

The relative inefficiency of smear examination is adequately demonstrated in table 1, but there has never been any suggestion from physicians that the combination of smear and culture failed to detect any suspected clinical case.

Table 2. Effect of transport time on culture results ¹

	Number of positives				Per-
Time, in hours	Total posi- tive	Culture positive, smear positive	Culture positive, smear negative	Culture negative, smear positive	cent posi- tive by cul- ture
Under 24 24–48	279 480	106 199	163 191	10 90	96. 4 81. 3
48-72	61	21	11	29	52. 5
72-96	45	20	16	9	80. 0
96 upward	18	6	4	8	55. 6

¹ All specimens received September 1953 through June 1955.

Indeed, recent work by Crookes and Stuart (14) shows that culture alone, aided by a selective agent to eliminate overgrowth of coliforms, can be depended on to identify practically all infections from patients under adequate clinical control.

The effect of transport time on culture results was assessed in earlier work (table 2), but the percentages have no absolute significance. The decided drop at the 48- to 72-hour period is apparently contradicted by the rise between 72 and 96 hours. The probable explanation of this peculiar finding is that a more interested and cooperative individual took most of the latter specimens. The figures, however, support the belief that culture is still very much worthwhile even after a swab has spent 4 days in transport medium, and these findings have now been considerably improved by a new culture technique (14).

Trichomoniasis

Investigation for the presence of *T. vaginalis* is carried out routinely on all specimens received for genococcal culture and in addition on all vaginal swabs submitted for general or special investigation. After cultures have been prepared, a small amount of material from the swab is suspended in a drop of normal saline on a slide. A coverglass is applied and the preparation is viewed by reduced illumination or by dark field for active trichomonad flagellar movement. In an earlier series of 400

consecutive specimens examined in parallel by a careful staining technique and by the above method, all clinical infestations were detected by the latter. Table 3 shows the findings in our gonococcal culture section over the past 4 years.

Dysentery

The chief value of the transport medium is its applicability to rectal swabs. The value of rectal swabs in the diagnosis of dysentery has been emphasized by Cruickshank and Swyer (15), and by Yannet, Leibovitz, and Deutsch (16), though their general usefulness has been doubted by Thomas (17) and decried by Shaughnessy, Friewer, and Snyder (18) for enteric investigations. Most workers agree that the rectal swab to be satisfactory must be kept moist and brought to the laboratory within 6 hours or so. Yet, in a dysentery outbreak in an isolated community the doctor or public health worker, coming perhaps from some considerable distance, may with luck obtain a few specimens of feces but can never hope to investigate at all adequately the incidence or epidemiology of the disease unless he can take rectal swabs. These can readily be collected from a large number of people within a short time, but they can rarely be brought or sent to the laboratory in less than 24 hours.

Experimentally, the transport medium has regularly been found effective in maintaining viability of *Shigella* and *Salmonella* species on rectal swabs for more than 48 hours and has even been found superior to parallel feces specimens up to 4 days. The results of a recent field experience are shown in table 4. Insufficient parallel specimens were received for statistical analysis, but the physicians' increasing

Table 3. Identification of Trichomonas vaginalis from cervical and urethral swab specimens in transport medium

Year	Num- ber of speci- mens	Num- ber positive	Per- cent positive
1954	3, 039	730	24
1955	3, 243	675	21
1956	3, 513	739	21
1957	5, 042	1, 559	31

Table 4. Field experience in Sonne dysentery outbreak ¹

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Type of specimens	Number of speci- mens	Positive speci- mens	Percent positive
Parallel specimens			
Feces	19	11	58
RST	19	13	68
Individual specimens			
Cases and contacts:			
Feces	143	72	50
RST	99	65	66
Convalescents and carriers:			
Feces	34	2	6
RST	349	36	10

¹ Transport time averaged 2 days.

RST—rectal swab in transport medium.

enthusiasm for the transport rectal swab is revealed in its increased use for convalescents and carriers in the later stages of the outbreak.

During 1956 and 1957, 4,059 specimens were examined in the central provincial laboratory specifically for dysentery organisms. Of 3,469 feces, 100, or 2.9 percent, were positive; of 522 rectal swabs in transport medium, 32, or 6.1 percent, were positive, and of rectal swabs in ordinary tubes, 68 were all negative. (Shigella sonnei and Shigella flexneri were isolated in approximately equal numbers.) Such evidence suggests that rectal swabs in the transport medium are not inferior to specimens of feces for the isolation of Shigella species. Although the method has never been recommended for the investigation of Salmonella infections, the following strains were coincidentally isolated from these rectal swabs received in the transport medium; 1 S. paratyphi B, 7 S. typhimurium, and 1 S. tennessee. The effect of time of transport of rectal swabs under field conditions could be assessed in 228 instances when this time was known accurately. For 105 it was one day, and for 123, two or more days. The incidence of detection of Shigella was exactly 11 percent in each group.

Haemophilus Infections

Cooper (11) has shown experimentally that Haemophilus influenzae and H. pertussis re-

main alive in the Stuart swab kit for 28 days, but no figures are available from any large-scale field investigation. Dr. H. Robertson and Dr. H. O. Dillenberg, from the Provincial Public Health Laboratory in Saskatchewan, have provided me with their findings in a small outbreak of whooping cough. From 29 specimens received as swabs, cough plates, or serum slants, H. pertussis was isolated only once, whereas from 17 specimens received as swabs in the transport medium H. pertussis was isolated in 10 cases. Dillenberg also mentioned that he was able to culture H. pertussis from such swabs after holding periods of 3 and 4 days. Haemophilus vaginalis, recently described by Gardner and Dukes (19), also appears to be a difficult organism to investigate. Amies and Jones (20) in this laboratory have succeeded in isolating it from 19 out of 371 cervical swabs submitted in transport medium for routine gonococcal culture.

General Throat and Superficial Infections

The value of the described transport medium for throat pathogens has been more than adequately stressed by Cooper (11). In this laboratory over the last 2 or 3 years the transport medium has been recommended on various occasions to city and health unit medical officers. These occasions have generally concerned outbreaks of particular infections, such as diphtheria and beta hemolytic streptococcal disease, particularly when a considerable holding period was inevitable between the taking of the specimens and their delivery to the laboratory. In 1957 a total of 1,020 such specimens were received, and from these 230 Streptococcus pyogenes, 344 Staphylococcus pyogenes, and 23 Diplococcus pneumoniae were reported as probably significant pathogens. Nine of these pneumococci were isolated in pure culture from eve swabs, one after 4 days of transport time. This finding may indicate the value of the transport medium in such specimens from which significant growths are often difficult to obtain.

Whether or not the transport medium is advantageous in ordinary throat infections is debatable. Over the 4-month period January to April 1957, 1,180 throat swabs were received, as ordinary swabs and as swabs in transport

medium, from out-of-town areas at transport distances of 1 to 4 days; 640 swabs were received in transport medium and 540 as ordinary swabs. The area distribution of these specimens was approximately equivalent. Streptococcus pyogenes was isolated from 19 percent of the ordinary swabs and from 25 percent of the transport medium swabs. This difference is of doubtful significance, but it might be considered in relation to a parallel observation that the percentage of isolations of streptococci from throat swabs in transport medium remained constant regardless of whether the specimens had been in transit 1, 2, 3, or more days, whereas there appeared to be a considerable drop in the recovery of such organisms from ordinary swabs more than 2 days old.

Because of the enthusiasm of clinical workers for the transport medium, however, it became necessary to minimize these differences in order to protect the laboratory from an inordinate amount of medium making and to restrict the use of transport outfits to health officers in distant areas or under special circumstances. Since the medium and transport outfit are now commercially available, this attitude may have to be revised.

Disadvantages of the Transport Medium

A little extra care must be used by technicians in extracting the swab from the transport jelly, and a trivial delay is imposed during inoculation of culture media by the manipulation of the short swab. Of more significance is the occasional apparent multiplication of gramnegative bacilli on transport swabs even in the absence of recognized nutrients in the transport medium. This is suggested by the finding of heavy growths of coliform bacilli (mainly Escherichia and Aerobacter species) from about 5 percent of throat swabs in transport media compared with about 1 percent from ordinary swabs. If coliforms in large numbers can interfere with the isolation of hemolytic streptococci they may be even more troublesome with gonococci, especially because they are likely to be more common on swabs from the genitalia. This supposition, raised only after the recent observations on throat swabs, has been supported by a study of laboratory records. Of 100 consecutive culture "failures" over several years, at least 50 were associated with heavy growths of coliform bacilli.

Such observations led to the search for a selective agent which would specifically inhibit coliform bacilli while allowing the growth of all desired pathogens. This agent was particularly difficult to find in connection with Neisseria. Search for an agent suitable for incorporation into transport media was soon abandoned. Standardization of the time of exposure is essential to the use of any bacteriostatic agent, and transport time of specimens is completely uncontrollable. In culture plates, however, aerosporin(A) (polymyxin B sulfate) has been found to have in low concentrations a regular and specific differential activity between coliforms and pathogenic Neisseria, inhibiting the former and leaving the latter unaffected. The beneficial effect on the culture of gonococci achieved by adding sterile aerosporin solution to a final concentration of 1 microgram (10 units) per milliliter in Peizer's medium has been described (14), but this technique cannot easily be applied to the isolation of other bacteria. Blood agar plates are generally used for this purpose. The preparation of special batches of this routine medium with aerosporin incorporated would be impracticable in most laboratories because of its irregular use, and parallel cultures on routine and aerosporin media would be expensive and tedious.

Surface impregnation of one-half of a blood agar plate with a few drops of a 25-microgram (250 units) per milliliter of aerosporin solution, prepared by appropriate dilution in water

Table 5. Application of aerosporin technique to selected throat swabs in 89 specimens

Organisms	Routine 2	Aero- sporin ³
Coliforms	29	4 11
Proteus Streptococcus pyogenes	2 4	17
Staphylococcus pyogenesPneumococcus	11	25 5

¹ Transport time averaged 2 days.

Distinctly inhibited in 6 specimens

One-half ordinary blood agar plate.
 One-half same blood agar plate after surface application of 250 units/ml. of aerosporin.

of the sterile powder provided for intramuscular use, is a simple and effective compromise. This is done prior to inoculation, which is carried out as soon as the plate has dried. Table 5 shows the results from 89 throat swabs, known or suspected to contain coliform bacilli, cultured on such media. Each swab was spread uniformly over the culture plate, one-half of which was the aerosporin test, the other half the routine control.

This technique has not been adopted fully into routine use, chiefly because it is only occasionally necessary. The incidence of coliform bacilli is rarely high enough to cause significant trouble, but whenever necessity has arisen the technique has proved satisfactory. All common respiratory pathogens except Haemophilus strains can be effectively isolated by this special technique. Haemophilus strains, of course, can still be recovered from the untreated portion of the plate in the usual manner.

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Laboratory experience over a number of years in the use of a non-nutrient transport or holding medium for bacteriological swabs has been described. The method is simple in clinical use, easy in laboratory manipulation, cheap, and of wide applicability. Its greatest value is in the transport of delicate organisms such as Neisseria, Trichomonas, and probably Haemophilus pertussis, and of Shigelia species on rectal swabs when such specimens are desirable or necessary. It has a further application certainly in the transmission of eye swabs and under special circumstances in the investigation of throat and superficial infections.

The most delicate bacteria appear to survive uniformly over a 24-hour transport period and with considerable regularity up to 48 hours. Even up to 4 days transport time, swab specimens for the diagnosis of gonorrhea in females yield more positives by culture than do corresponding smears by microscopy. Sturdier bacteria survive better.

In general the absence of nutrients from the transport medium insures that the bacterial status quo of specimens is well preserved, but very occasionally coliform bacilli appear able to multiply even in this environment. Whenever this is likely to be a nuisance it can be counteracted easily after the transport swab reaches the laboratory by the use of aerosporin (polymyxin B sulfate) in culture media, either by incorporation or by surface application.

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(A) Sterile Intramuscular Powder, manufactured by Burroughs, Wellcome and Co.

Study of Back Supports for Premature Infants

The effect on premature infants of a diaper-roll support to the lower back has been the subject of a research study conducted jointly by the Division of Nursing Resources, Public Health Service, and Bellevue Hospital, New York City. Data were collected at Bellevue from April to November 1958.

Round-the-clock observations of the behavior of 30 premature infants receiving routine care and a like number supported by diaper rolls have indicated thus far that the use of the roll does not result in weight gain of the prematures but may contribute to the well-being of the infants by increasing sleeping time and reducing crying. Analysis of the data, now underway, may produce new knowledge on premature infant behavior for nurses, physicians, and social scientists.

The idea for the diaper roll was conceived by Eileen Hasselmeyer, R.N., M.S., nurse consultant with the division, who was chief investigator of the study. She had noticed, several years ago, that premature infants pushed, wriggled, or squirmed until they achieved a position giving support to the lower back.

Miss Hasselmeyer has been awarded a National League for Nursing fellowship for 2 years of study toward a doctorate in the nurse education department of New York University.

Radiation Control Activities in a Local Health Department

M. R. ZAVON, M.D.
C. A. WILZBACH, M.D.

WHAT can be done to control ionizing radiation in this day of increasing awareness of its hazards? More specifically, what can be done by a local health department already burdened with all the work it can handle and beseiged by cries on every side for funds for additional programs?

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The Cincinnati Board of Health has met this question with a series of activities aimed at reduction of exposure to radiation. The program thus far, only a bare beginning, has been conducted with a minimum in budget, personnel, and equipment, but we believe it has proved worthwhile.

Accidental Contamination Incidents

In Cincinnati in 1952 a radium capsule, used for instrument calibration, fractured in the ordinary course of operation. By the time the situation became fully understood an entire three-story building had become contaminated, and the 220-odd employees had to be examined for possible radiation exposure. With the exception of contamination of the building there were no serious effects from this accident, but it did serve to alert the health department to the need for greater awareness of the presence and potential hazard of sources of ionizing radiation.

A fire in this same building a year later raised the specter of danger to firemen fighting the fire. As a result, with the help of the Atomic Energy Commission and the cooperation of the Public Health Service, a course on radiation for firefighters was held in Cincinnati in 1953. In 1954 a quarter curie of polonium was spilled at a local industrial plant, and the health department assisted in the cleanup operation. Occasional calls for assistance in monitoring X-ray installations were answered, but no regular program was developed.

Development of a Program

In 1955 it became evident that an organized program of radiation control was needed. A physician with previous experience in radiation protection work, who had been hired part time as director of occupational health services, commenced the radiation control program with minimum equipment.

Two steps were taken initially. One, the State health department was asked to forward copies of radionuclide authorization reports from AEC. Two, a survey was begun of shoefitting fluoroscopes in use in the shoe stores of the city. Each shoe fluoroscope was inspected, and a form containing some 35 items completed. The owner was advised verbally and in writing of any glaring defects, and at the conclusion of the survey the findings were presented to the Cincinnati Board of Health. The survey, conducted by one man who had other responsibilities as well, took approximately 1½ years. In all, 34 machines were surveyed.

Dr. Zavon is director of occupational health services, Cincinnati Health Department, and assistant professor of industrial medicine at the Kettering Laboratory of the University of Cincinnati. Dr. Wilzbach is health commissioner of Cincinnati. "Radiological Health Practice" (24 pages, self-cover, 65¢ per copy) has been prepared and published by the Program Area Committee on Radiological Health, American Public Health Association. Complimentary copies are being distributed to State health officers and State sanitary engineers.

From the experience in this survey we concluded that the cost of inspecting these machines routinely would be prohibitive. In addition, putting what amounted to a health department seal of approval on shoe-fitting fluoroscopes seemed a dubious practice in the face of the unnecessary radiation exposure that they represent. At two meetings with the shoe dealers we discussed the situation. Shortly thereafter the shoe dealers requested the board of health to ban the use of these machines. The board did so by passing a regulation having the standing of a city ordinance or a State law.

At this point we decided that the radiation program would benefit from outside assistance and support. Consequently, the board of health appointed a Radiation Advisory Committee, consisting of technically qualified persons from industry, labor, medicine, dentistry, and public health. The health commissioner, the director of occupational health services, and the chief of the bureau of air pollution control are ex officio members. From the committee has come advice as to procedure and priorities.

About the same time that the advisory committee was formed another major step in the control program was initiated. Working with and through the Cincinnati Dental Society, the city undertook to alert the local dental profession to the need to reduce radiation exposure for themselves and their patients to the minimum consistent with diagnostic needs. A talk to the dental society was followed by a short article in its journal. This in turn was followed by an offer to arrange for proper coning and filtration for all dental X-ray machines. Approximately 50 percent of the membership of the dental society accepted the offer.

Arrangements were made with the two largest local dental suppliers to install aluminum filters on any dental machine for a fixed maximum fee or to furnish the necessary filters to

the dentist for him to install. The added filtration was to bring the total to the 1.5 mm. recommended in the National Bureau of Standards Handbook 60 (1955).

At this writing the installation of filters is nearing completion. When it is finished, the city will arrange through the dental society for a film badge service for those dentists who wish it. Use of a film badge for 13 weeks should enable us to gain some idea of the radiation exposure of the dentist and his assistants. If indicated, office surveys and corrective action can then be undertaken.

We are now facing the question of requiring registration of all radiation sources in order to determine their location. Already working closely with the fire department, the health agency has organized a list of known radionuclide users and has advised on procedures for handling fires where radiation may be a factor. The fire department in turn has held short courses for its personnel. Other city departments and other members of the board of health are cooperating in the further development of a radiation control program. The program will be integrated into our regular operating programs insofar as possible, and regular personnel will be trained to do a continuing job.

Additional activities will be necessary in the development of a well-rounded program, but there are limitations imposed by political boundaries which can be overcome only if State authorities take action. The bureau of air pollution control in the Cincinnati Department of Public Safety has long conducted routine air monitoring for radiation, but the confines of a city are too narrow for effective control of radiation in air or water. Nevertheless, we believe that municipal departments with responsibility for air and water must be as aware of radiation sources as they would be of any other contaminant.

Cincinnati's program in radiation control, by using existing facilities and cooperating agencies wherever possible, has developed and grown without significant additional expenditures. We believe that much can be done by cities of our size, 500,000, and smaller ones, to limit or reduce exposure to radiation with available facilities and staff.

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By Arthur S. Flemming, Secretary of Health, Education, and Welfare, at press conference on March 16, 1959

Public Exposure to Radiation

DURING the past 2 weeks there has been, as you know, considerable public discussion about radioactivity and the effect upon health caused by the presence of radioactive elements in wheat, milk, water, and other foods.

Some of the discussion has resulted from the release by the Public Health Service of its reports on radioactivity in milk.

I think it is desirable to emphasize several points:

1. Radiation is not new in our environment, but the problems of radiation in the nuclear age are obviously growing and will be with us from now on. These problems cannot—and should not—be minimized.

2. There are many sources and kinds of radiation, such as cosmic rays and medical X-rays, some of which contribute more than fall-out to the total radiation to which the population is exposed.

3. Many scientists are seriously concerned with the cumulative effects on human beings of repeated small exposures of radiation, and research is being done by the Public Health Service, the Atomic Energy Commission, and others to ascertain these effects. We are developing plans to enable the Food and Drug Administration to engage in research in this area.

4. Our scientific information at this time is not sufficient to evaluate precisely the long-term health effects of the small amounts of radioactivity now contained in water, air, milk, and other foodstuffs. Continuing and expanding efforts will be made to put ourselves in a position to make precise evaluations.

5. The Public Health Service has repeatedly emphasized that the amount of radioactivity

found in milk is well within the tolerable limits as established by the National Committee on Radiation Protection and Measurement. These limits are the only benchmarks now available.

6. Some of the figures in the milk studies have been misunderstood and need further explanation.

7. The Public Health Service has proposed a further major step-up in its expanding radiological health activities.

Both the Public Health Service and the Food and Drug Administration of this Department have responsibilities in this area. It is apparent that the activities carried on in connection with these responsibilities will need to be substantially strengthened in order to deal with the health problems which radiation increasingly presents.

With respect to the hazards of radiation, we should remember that according to present theory any radiation may be hazardous to health. The degree of hazard may be great or negligible depending on many factors—strength, duration of the exposure, the part of the body exposed, previous exposure, and so on.

Surgeon General Burney advises me that some of the harmful effects that can result from radiation, and about which there is concern, are genetic mutations, the shortening of the lifespan, and increased incidence of certain types of cancer, including leukemia.

The Atomic Energy Commission has been conducting studies on a broad basis for 5 years, including studies of radioactive elements in water, air, and soil as well as human bone and some foodstuffs. Studies which have been un-

dertaken more recently by the Public Health Service supplement some of the studies by the Atomic Energy Commission.

With respect to the Public Health Service's milk sampling study and the reports on it, we need to take into account a number of factors.

Milk was chosen for our initial study among the foods for several reasons. One of the radioactive isotopes of most concern is strontium-90, because this element has a much longer life than most isotopes, because in the biochemical processes of the body some strontium-90 is deposited in the bones, and because strontium-90 is present in milk. Since milk and milk products properly represent such a large part of our national diet, it is likely that a sizable proportion of the strontium-90 that stays in the body comes from milk and its products.

In addition, of course, milk is produced in all parts of the country all year and is thus readily available for uniform scientific study.

As published reports of the Atomic Energy Commission, Public Health Service, and other studies show, strontium-90 and other radioactive elements are also present in wheat, soybeans, water, air, grass, and in the soil itself.

With respect to possible misunderstandings about the figures contained in the Public Health Service monthly reports on radioactivity in milk, it is important to remember that they should be considered in relation to other figures. The National Committee on Radiation Protection and Measurement, on the basis of the scientific opinion available to it, has set maximum permissible limits for lifetime exposure of the individual to specific radiation and radioactive materials.

These limits were adapted from safety standards for persons working in close proximity to sources of radiation, such as medical X-ray technicians. The occupational permissible limits were divided by 10 to provide permissible limits for the general population.

For strontium-90, for instance, the committee's current recommendation for a maximum permissible concentration is 80 micromicrocuries per liter of water or milk. This means that on the basis of present knowledge the average concentration of strontium-90 among all items of the diet—water, meats, vegetables, bread, and so on—could be 80 micromicrocuries per

liter (or per kilogram—2.2 pounds) for a lifetime without exceeding the current maximum permissible concentration.

(A curie is the amount of radioactivity in 1 gram of radium. A micromicrocurie is one millionth of a millionth of a curie.)

Average yearly levels of radioactivity in milk are far more significant than monthly levels because the yearly averages are more accurately comparable with lifetime permissible limits. For strontium-90, for example, there was an increase in St. Louis, Mo., from 12.2 micromicrocuries in October 1958 to 20.1 in November 1958 (which then dropped back to 15.6 in December). The average level for the year ended October 1958 was 11.4 compared with 12.5 as the average level of the year ended November 1958. This yearly average is to be compared with the 80 micromicrocuries per liter currently used as the lifetime permissible concentration.

I am advised—and it should be emphasized—that these so-called permissible limits are only calculated estimates. They will be subject to change as more and better scientific data are developed about radioactive elements and their effect on the human body.

For example, there has already been some public discussion related to lowering the recommended levels for some elements, such as strontium-90. Further consideration should be given to the amount of strontium-90 which is distributed and retained in the body. A great deal more research is needed to provide data for a more accurate correlation between the amounts found in foodstuffs and their lodgment in the body.

For the time being the current maximum permissible limits represent the most informed scientific opinion available to us.

However, when the total amount of radiation to which people are exposed is increased, measures should be taken to reduce radiation over which we have some control. This led the Public Health Service to advocate several years ago the abolition of X-ray machines used in some stores for fitting shoes, and a year ago the substitution of skin tests for mass X-ray surveys as the first step in detecting tuberculosis.

Last September I discussed at a press con-

ference the range of activities conducted by the Department in the field of radiation.

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We are now working with the Food and Drug Administration to determine what can be done to enlarge its capabilities for carrying out its statutory responsibilities as they relate to the field of radiation.

With respect to the Public Health Service program, the Department's budget for 1960 calls for slightly more than a doubling of the capabilities of the Public Health Service in the field of radiation. The request is for an appropriation of \$1,439,100, an increase of \$805,000 and the largest single increase in the Public Health Service. This is in addition to about \$2 million being devoted to the study of radiation by the National Institutes of Health through grants-in-aid and in its own laboratories. The expanded Public Health Service effort would be made in three categories—research, technical assistance to States and communities, and training of personnel.

Dr. Burney advises me that this research will have as its aim the development of better knowledge concerning the effects of radiation on the human body. To obtain more knowledge in this aspect of the problem, studies will be made in two types of population groups—individuals exposed to radiation in industry and individuals exposed in the course of medical diagnosis and therapy.

In addition, the research would seek to simplify and standardize tests used to measure those radiation levels which affect people. With such standardized methods, a national

system could be devised, with the help of State and Territorial public health agencies, for analyzing and exchanging information on radiation.

Technical assistance to the States and communities would include the assignment of trained Public Health Service personnel to selected State, local, and regional offices. It would also include a survey to identify and assess nationwide radiological health resources. One aspect of this survey would be to identify personnel who might be most readily trained for work in radiological health.

The training activity would cover expansion of the existing number of professionally trained persons responsible for direction of national and State program activities in radiological health. The experience gained in these training activities would be applied to the training programs conducted by State and local health agencies. I feel that these steps are essential in the fiscal year 1960, and that if taken they can provide fruitful results on which to build additional knowledge and measures for health protection against radiation.

It is quite clear that the problem of radiation in our environment is one we must learn to live with. In fact, it has always been with us. It has national and international implications of a most complex nature. As I have indicated, we need, as a first objective, to learn much more than we know now about the whole subject. Our objective in this Department is to aid in this effort in every way possible.

Human Genetics Research Training

A 5-year program to train research scientists in human genetics will begin September 1959 at the University of Pittsburgh Graduate School of Public Health. The university has received a \$16,000 grant from the Public Health Service for the first year.

Designed for students of biology with a master's degree, the course covers the hereditary aspects of various diseases, particularly those important to public health. The plan of study will be tailored to the background and research interest of the individual student. Dr. Ching Chun Li, associate professor of biostatistics and president-elect of the Society of Human Genetics, will direct the training.

Blindness in California Children

NEDRA B. BELLOC, M.A., PHYLLIS H. MATTSON, M.S., and WILLIAM D. SIMMONS, M.P.H.

MAJOR causes of blindness in each age group must be fully explored before preventive efforts can be productive. Planning special educational services for blind children requires a knowledge of the numbers of such children in the population.

In 1954, a prevention of blindness project was undertaken by the California State Department of Public Health. The need to determine the causes of blindness in children and to obtain information on their number and age distribution resulted in this study, done in 1956.

Previous surveys of blind children made by the National Society for the Prevention of-Blindness (1, 2) have been limited necessarily to reports from a few cooperating agencies in each participating State. In an effort to make this survey as comprehensive as possible, the prevention of blindness project undertook to gather data about all of the blind and partially sighted children known to school districts with special classes, the State school for the blind, the Variety Club's Blind Babies' Foundation, and the California State Department of Education.

The staff of the project visited each of the 29 school districts with special classes, transcribing from the medical records data on visual acuity, pathology, etiology, other handicapping conditions, and prognosis, as well as age and sex of each child. Teachers and coordinators were asked whether they knew of other blind children who were not enrolled in the special classes. Such children were included if medical records were available which enabled an assessment of their difficulty either in terms of visual acuity or diagnosis. The Blind Babies' Foundation, a voluntary agency which provides a home counseling and teaching service, supplied similar information for children currently on its rolls. The department of education made available its file on children about whom teachers or parents had inquired. These records were used only if there had been communication about the child during 1955 or 1956 (the 15 months preceding the survey), and sufficient information had been given to establish either or both the visual acuity and diagnosis. Records duplicated from more than one source were eliminated.

Although information was gathered on more than 600 partially sighted children, this report is limited to blind children (those with visual acuity of 20/200 or less in the better eye with maximum correction). Similarly, while records were obtained on a few children over 18 years of age, this report deals only with those

The authors, at the time of the survey, were associated with the prevention of blindness project, a special assignment in the division of preventive medical services, California State Department of Public Health in Berkeley. Mrs. Belloc and Mrs. Mattson were respectively associate statistician and junior public health analyst. Mr. Simmons was supervisor. The project was financed by a grant from the W. K. Kellogg Foundation.

under 18. Included were 1,338 children, of whom 568 were under the age of 6, and 770 between 6 and 17.

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These children do not represent a complete count of the blind children in the State. At least two sources of children known to be blind were not included. A private nursery for blind children in southern California reported that it had 18 children enrolled, and 52 others on its "cradle roll," but refused to permit its medical records to be used for the study. Consideration was given to the inclusion of children in Sonoma, Porterville, and Pacific State Hospitals, and estimates received from the superintendents of these institutions indicate that there are approximately 160 blind children in residence. These were not included partly because it was felt that the primary handicap was not blindness, and also it would have been difficult to obtain complete diagnostic information on a case-by-case basis.

That there may be as many as 200 blind children in the State who are not enrolled in school or known to agencies offering services to preschool blind children was suggested by a review of the records in the department of education. In addition to the 110 children about whom there had been correspondence in 1955 or 1956, there were 229 last discussed in correspondence dated 1954 or earlier. It is difficult to believe that many of these children have died or moved from California. There was evidence that cerebral palsy or mental retardation was present in a fairly high proportion of these cases, and it is possible that some are receiving care in institutions for these conditions. It seems likely that a substantial number of blind children are being cared for at home or in regular schools, without benefit of the specialized training required if they are to become self-sufficient adults.

Even with the exclusions mentioned above, the number of children included in the survey yields rates of blindness considerably higher than those found by previous studies (1, 2). Because of the method used, these rates may be considered to represent minimum estimates of the number of blind children in California.

At least 33 children in every 100,000 were blind, with the rate among preschool children as high as 46 in those 4 years of age (table 1).

The high rates among children 2, 3, and 4 years of age were due to the prevalence of retrolental fibroplasia in that age group. Fortunately, it was discovered that this condition was caused by the use of excessive oxygen for newborn premature infants (3). The establishment of control measures for the administration of oxygen (4) has reduced drastically the incidence of this condition in the 3 years since this survey was made. Recent checks with the two agencies in California concerned with preschool blind children (5) revealed that they were serving 23 children with retrolental fibroplasia who were born in 1955, 9 born in 1956, 1 born in 1957, and so far none born in 1958. It is to be noted that children with retrolental fibroplasia born in the peak years 1951-53 are now reaching school age. Unless their increased number is offset by decreases in blind-

Table 1. Number of blind children covered in survey, with rates per 100,000 children, by age, California, 1956

Age, in years ¹	Total number in survey	Rate per 100,000 children ²
Total	1, 338	38
Under 1	28	(3)
1	76	(3)
2	132	43
3	125	43
4	126	40
5	81	30
3	105	38
7	97	3.
3	85	30
	75	30
0	74	3
1	67	35
2	66	35
3	48	2
4	43	26
5	38	24
6	37	24
7	28	4 18
Not known (but school age)	7	

¹ As of Dec. 31, 1955.

² Based on population estimates of the California State Department of Finance.

Rate not computed because coverage of very young children is obviously less complete than for other ages.
 Coverage of 17-year-olds is probably less complete than for younger school-age children because many at

this age have left school.

Table 2. School status of 1,338 blind children, California, 1956

School status	Total	Ages 5 years and under	Ages 6–17 years	Percent of those 6–17 years
Total	1, 338	568	770	100. 0
Regular class	75	8	67	8. 7
Special program 1	233	34	199	25. 8
Sightsaving class 2		4	273	35. 5
School for the blind		5	140	18. 2
Other 3	94	77	17	2. 2
Not in school	445	419	26	3. 4
Unknown	69	21	48	6. 2

¹ Regular classes with supplementary work in Braille.

² Special classes using large-print textbooks.

3 Includes nursery schools, tutors, and so forth.

ness due to other causes in the younger ages, we can expect during the next 10 or 12 years, as they move through the school grades, to deal with problems of education for a greatly increased number of blind children.

It is not surprising that most of the children were of school age and attending classes, since the records used in the study were obtained primarily from schools (table 2). The largest group of children (35 percent) were enrolled in so-called sightsaving classes, in which large-print materials are used. Another 25 percent were enrolled in regular classes with work in Braille given by a special teacher. Eighteen

Table 3. Other handicapping conditions in 1,338 blind children, California, 1956

Principal other handi- capping condition	Number	Percent of total
Total	1, 338	100. 0
Not specified	683	51. 0
None Total known to have one or more	426	31. 8
handicapping conditions	229	17. 1
Mental retardation	57	. 4. 3
Severe mental retardation	22	1. 6
Cerebral palsy	45	3. 4
Epilepsv	9	. 7
Hard of hearing	10	. 7
Deafness	8	. 6
Speech defect	6	. 4
Diabetes	1	. 1
Other 1	71	5, 3

¹ Includes congenital heart conditions, cleft palate, loss or malformation of arm or leg, developmental retardation, and emotional disturbances.

percent attended the resident school for blind children in Berkeley.

Diagnostic information was taken from forms which differed in the various agencies. Many of them did not provide specifically for a description of other handicapping conditions. More than one-half of the records had no information about such conditions. It is therefore probable that the figures shown in table 3 represent an understatement of the number of these conditions present in conjunction with visual impairment. Severe conditions, however, such as mental retardation or cerebral palsy, would be likely to be mentioned if present, and were indicated in almost 10 percent of the records. Seventeen percent of all the children surveyed were known to have one or more handicapping conditions other than blindness.

Causes of Blindness

The diagnostic information given on the medical records was coded according to the Standard Classification of Causes of Blindness recommended by the Committee on Statistics of the Blind, 1956 revision. Since many records showed multiple pathologies, it was necessary to adopt certain arbitrary rules for selecting the one to be coded. Congenital malformations were given preference over infectious conditions, and these in turn were coded before refractive errors or muscular difficulties. Optic nerve atrophy was not coded unless it appeared to be primary. Retrolental fibroplasia was coded as primary regardless of associated or complicating conditions. Nystagmus was coded only if it appeared alone. The etiology was coded with an abbreviation of the standard classification, since the number of cases did not warrant a finer breakdown.

The sites and types of affections of eye conditions are shown in table 4. Since retrolental fibroplasia caused a large proportion of blindness in the younger ages, this table divides the children into groups 5 years of age and younger and 6 to 17 years of age. Nearly three-fourths of the former group were affected by retrolental fibroplasia. Structural anomalies accounted for more than one-quarter of the conditions in the older age group. Retinal

Table 4. Site and type of affection of eye conditions of 1,338 blind children, California, 1956

		Number		Percent					
Site and type of affection	Total	Ages 5 years and under	Ages 6–17 years	Total	Ages 5 years and under	Ages 6–17 years			
Total	1, 338	568	770	100. 0	100. 0	100. (
Structural anomalies	249	39	210	18. 6	6. 9	27. 8			
Myopia	66	2	64	4. 9	. 4	8. 3			
Albinism	50		50	3. 7		6. 5			
Megalophthalmos	46	12	34	3. 4	2. 1	4. 4			
Multiple	36	7	29	2. 7	1. 2	3. 8			
Other structural anomalies	51	18	33	3. 8	3. 2	4. 3			
Cornea	12	1	11	. 9	. 2	1. 4			
Lens	158	26	132	11.8	4. 6	17. 1			
Cataracts	145	23	122	10.8	4. 0	15. 8			
Other lenticular disorders	13	3	10	1. 0	. 5	1. 3			
Uveal tract	30	3	27	2. 2	. 5	3. 5			
Retina	632	438	194	47. 2	77. 1	25. 2			
Retrolental fibroplasia (including associated or com-									
plicating conditions)	547	417	130	40. 9	73. 4	16. 9			
Retinal and/or macular defects or degeneration	29	3	26	2. 2	. 5	3. 4			
Other retinal disorders	56	18	38	4. 2	3. 2	4. 9			
Optic nerve, optic pathway, and cortical visual centers.	104	28	76	7. 8	4. 9	9, 9			
Optic nerve atrophy	83	24	59	6. 2	4. 2	7. 7			
Other optic nerve disorders	21	4	17	1. 6	. 7	2. 2			
Other	92	10	82	6. 9	1.8	10. 6			
Vitreous	6	1	5	. 4	. 2	. 6			
General degenerative changes	13	3	10	1. 0	. 5	1. 3			
Macular disorders									
Squint, strabismus, esophoria, esotropia	12	2	10	. 9	. 4	1. 3			
Nystagmus	38	3	35	2. 8	. 5	4. 5			
Other muscular disorders	1	1 _		. 1	. 2				
Refractive errors	22		22	1. 6		2. 9			
Site not specified	61	23	38	4. 6	4. 0	4. 9			

conditions, including retrolental fibroplasia, represented another 25 percent, and affections of the lens, primarily cataracts, totaled 17 percent.

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Of more importance from the standpoint of preventive efforts are the causes of blindness shown in table 5. Administration of excessive oxygen was assumed to be the cause of retrolental fibroplasia in 547 children, or 41 percent of the total in all ages. Congenital conditions made up the next largest group, accounting for 14 percent of the preschool group and nearly half of those in the older age group. etiology was unknown or unspecified in about 15 percent of the cases. It can be safely assumed that many of those for whom no etiology was given had conditions present at birth. If the number of blind children is to be substantially reduced, some way must be found to prevent occurrence of the conditions producing abnormalities in the newborn.

In most of the cases in this study, excluding

retrolental fibroplasia, the actual cause of the blindness was unknown. It was merely reported as present at birth. This is an area in which careful, definitive research in the causes of blindness should be undertaken. Infections of the mother in pregnancy were said to be responsible for a little more than 2 percent of the cases, while infections of the child accounted for 1 percent.

Injuries, other than birth injuries, were responsible for blindness in 28 children, or 2.1 percent of the total. Since these were presumably all preventable, they warrant attention out of proportion to the small number of cases. In nearly 40 percent of the accident cases, the agent was not specified. Of those in which this detail was given, 7 cases, or nearly 30 percent, were due to explosions. Of these, four were boys between the ages of 6 and 10 who were playing with dynamite caps. Falls, including being dropped in infancy, were responsible for 6 cases.

Table 5. Causes of blindness in 1,338 blind children, California, 1956

		Number		Percent					
Cause of blindness	Total	Ages 5 years and under	Ages 6–17 years	Total	Ages 5 years and under	Ages 6-17 years			
Total	1, 338	568	770	100.0	100.0	100.0			
Prenatal infectious diseases		11	19	2.2	1.9	2.5			
Postnatal infectious diseases		2	11	1.0	.4	1.4			
Birth injury	11	3	8	. 8	. 5	1.0			
Other injury		3	25	2.1	. 5	3.2			
Retrolental fibroplasia (excessive oxygen)		417	130	40.9	73.4	16.9			
Neoplasms	38	15	23	2.8	2.6	3.0			
General diseases, not elsewhere classified	12	1	11	. 9	.2	1.4			
Congenital conditions, not elsewhere classified	455	79	376	34.0	13.9	48.8			
Unknown or unspecified	204	37	167	15.2	6.5	21.7			

Tables 4 and 5 were tabulated for the condition in the better eve, which is consistent with the basis upon which the criterion for determination of blindness rests. It was recognized that this may have caused the loss for comparative purposes of a few serious conditions such as neoplasms, in favor of the affection of the better eye which might have a loss of vision due to myopia. A review of the records revealed that there were only 27 cases in which the coding for the two eyes would have been different. The net effect of changes in coding for these 27 cases would have been negligible. Adding the two neoplasms, for example, would have raised the percentage attributed to this cause from 2.8 to 3.0.

Summary

This study was undertaken to determine the causes of blindness among children in California and the number and age distribution of such children. Data were gathered from the medical records available in all school districts with special classes for blind and partially sighted children, the State school for the blind, the State department of education, and the Variety Club's Blind Babies' Foundation. While the coverage is not complete, it is believed that a very high proportion of the total number of blind children in the State is included.

The rate of blindness among children under the age of 18 was found to be 33 per 100,000 with the rate among preschool children as high as 46 in those 4 years of age. The high rate in the latter group is due to the large number of children born in the years 1951–53 who were blinded by retrolental fibroplasia, a condition found to be due to the administration of excessive oxygen to newborns.

Congenital conditions, primarily of unknown origin, were found to be the cause of a large proportion of blindness in the two age groups studied. A substantial reduction in the number of blind children in future years can only be achieved through the determination of ways to prevent these conditions.

Accidents, which are responsible for a relatively small number of cases, are nonetheless important since it may be possible by the regulation of such hazards as dynamite caps to prevent some tragic cases of blindness in young children.

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Economic Poisons Control

CONTROL of economic poisons in manufacturing, agricultural use, the home, and food establishments was the subject of a symposium held during Pennsylvania's seventh annual health conference at University Park in August 1958.

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In opening the discussion, Robert C. Stanfill of the Philadelphia District, U.S. Food and Drug Administration, restated today's general regulatory controls, emphasizing these points:

• The estimated death rate from all types of poisoning, solids and liquids, is one-third that of 50 years ago, but the total number of preventable deaths and injuries is still impressive. Negligence on the part of our citizens cannot be prevented solely by legislation.

• Drugs and disinfectants for man and animals are subject to the Federal Food, Drug, and Cosmetic Act of 1938 and its amendments. Under provisions of this act safe tolerances are set for residues of pesticides on crops.

• Pesticides and disinfectants for inanimate objects are controlled by the Insecticide, Fungicide, and Rodenticide Act of 1947.

• Twelve caustic and corrosive acids and alkalis in certain concentrations are designated in the Federal Caustic Poison Act of 1927. Some of these, especially lye which is still used in home laundries and in making soap at home, continue to take their toll of children.

 Many hazardous paints, cleaning compounds, solvents, and miscellaneous agents are not covered by these laws. • Use of precautionary labels on the 12 household size caustic and corrosive items is required, but adequate labeling of many more items is not covered by law. The incidence of accidental injuries may be reduced by thus identifying composition, harmful potentials, directions for safe use, and methods of emergency treatment.

• Enforcement of the Federal Food, Drug, and Cosmetic Act of 1938 and the Federal Caustic Poison Act of 1927, as amended, is the responsibility of the U.S. Food and Drug Administration. The U.S. Department of Agriculture is responsible for enforcing the provisions of the Insecticide, Fungicide, and Rodenticide Act of 1947 and its amendments. Mailing of certain poisons is controlled by postal laws. Packing specifications and warning regulations on shipping containers of acids, cosmetics, and explosives, are controlled by the Interstate Commerce Commission.

Summaries of other contributions follow.

Manufacturing Hazards

The term "economic poisons" includes a wide variety of chemicals and chemical compounds which have been developed for use in controlling, destroying, or repelling harmful insects or rodents, and predatory animals or other forms of animal life. The term also includes chemical substances used to defoliate plants and hormone-like substances that regulate the growth of plants.

In the production of economic poisons, the manufacturer has responsibilities to his employees and to the community. Successful manufacture and marketing of a product highly toxic to humans requires an industrial medical and hygiene program that insures a healthful working environment for employees. Cyanides and organic phosphate insecticides are among those requiring rigorous safeguards.

The Cyanides

There is a long history of the use of cyanides as fumigants in the control of insects and rodents. Two forms of cyanides are processed at the Warners Plant of the American Cyanamid Company in rather large quantity. One is a solid form which contains approximately 42 percent Ca(CN)₂. The other is commercially pure hydrogen cyanide.

Calcium cyanide, a solid, is milled into various sizes depending on the ultimate use of the product. On exposure to air, it liberates hydrocyanic acid gas. It is essential, therefore, that processing equipment be maintained dusttight; otherwise, dust leaks into the workroom atmosphere lead to hazardous conditions.

The mill employed generates air pressure in the conveyors, elevators, and bins, and it is necessary to remove this pressure. This is accomplished through the use of the exhaust ventilation system. No attempt, however, is made to actually maintain the conveying equipment under a negative pressure since this would increase cyanide losses from the product. This condition of atmospheric balance is assured by a manometer in the ventilating system which is readily adjusted with a slide gate.

The drumming of the milled material is done with the aid of local mechanical exhaust ventilation. This provides an effective dust control and it is possible for the men to fill the drums without resort to gas masks.

Hydrogen cyanide is generated as a gas in reactors and is then condensed to a liquid. It is handled as a liquid from that point. Brine-cooled vessels are used. Here again, the main objective is to prevent the escape of hydrogen cyanide vapor from the equipment into the workroom atmosphere.

Hydrogen cyanide is a lethal gas and pre-

cautions must be observed wherever it is handled. At room temperature, it is a liquid but will boil at 79° F. With such a low boiling point, it is quite volatile and its vapor can penetrate all crevices and spaces to bring about the complete fumigation of the area being treated. Hydrogen cyanide gas is not irritating and, therefore, to the uninformed the potentially hazardous nature of an exposure may not be immediately apparent. This is true because the gas can be tolerated at concentrations that are dangerous. The gas is easily recognized by its odor which is like that of bitter almonds. The effect of HCN, in either gas or liquid form, is that of a chemical asphyxiant.

Hydrogen cyanide produces its toxic action with extreme rapidity. It is thought that hydrogen cyanide inactivates certain enzymes that catalyze oxidative processes in the tissues. Asphyxia at cellular level results from the arrest of the oxidative process. It is, in effect, a protoplasmic poison.

The essential health hazard in its processing is from inhalation. Absorption through the lungs is rapid. It can also be absorbed through the skin. If the skin is broken, or irritated, absorption is more rapid. The American Conference of Governmental Industrial Hygienists has established a maximum allowable concentration of 10 parts of hydrogen cyanide per million parts of air for daily exposures of 8 hours.

The symptoms following exposure to small quantities are headache, giddiness, fatigue, loss of appetite, and nausea. Rapid and complete recovery takes place upon removal from these small exposures. With greater exposure, additional symptoms may occur: sense of suffocation, vertigo, cyanosis, coma, convulsions, and death.

The greatest potential for escape of gas in our manufacture occurs from the reactors and from sampling points. Exhaust ventilation is employed rather extensively at the packings around the agitator bearings and at the sampling points, the entire system being connected to a water spray scrubber which prevents the discharge of hydrogen cyanide to the outdoors. The water is returned to the process to reclaim the cyanide collected.

The crude hydrogen cyanide is distilled and

stabilized, whereupon it is ready for packaging in compressed gas cylinders or as cyanide impregnated woodpulp disks. As a liquid, the material is handled quite safely although it is essential to maintain continued vigilance and care. Even small drops spilled on the floor can serve as a source of exposure to operators. These must be avoided.

Because hydrogen cyanide cannot be permanently stabilized, it is important that all cylinders be returned to the factory within 6 months of the filling date. This is necessary even though none of the hydrogen cyanide in the cylinder has been used. If allowed to stay in the cylinders indefinitely, the product may decompose. The accompanying heat and pressure may be sufficient to cause the cylinder to explode with possible loss of life and property.

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A major development in the growing list of economic poisons has been the manufacture of organic phosphate insecticides. One of the more toxic of the organic phosphates is parathion.

Parathion, when absorbed into the body, causes an inhibition of the enzyme cholinesterase and thereby allows the accumulation of large amounts of acetylcholine. cholinesterase levels are reduced, grave signs and symptoms may appear. These do not develop until the cholinesterase activity has been reduced to about 50 to 25 percent of normal. However, symptoms can also occur with a much smaller depression, provided it is rapid. The symptoms include headache, blurred vision, weakness, nausea, abdominal cramps, diarrhea, and tightness in the chest. The signs may include sweating, miosis, tearing, pulmonary edema, cyanosis, convulsions, coma, loss of reflexes, and respiratory muscle paralysis. Atropine, in excess of amounts conventionally employed, oxygen, and artificial respiration are used in the treatment of parathion poisoning. Lacking such treatment, death may re-The development of sensitive laboratory tests for the determination of cholinesterase levels in the blood has been most helpful in maintaining a continuous knowledge of the degree of exposure created by manufacturing operations. It is reported that new antidotes are

being developed for poisoning from this substance and they may offer improved treatment.

We have encountered little difficulty in the manufacture of parathion as a result of vapor exposures from the product. The most serious exposure hazard is the possibility of liquid parathion being absorbed through the skin. This exposure may occur from a small spill which may not be noticed immediately, since technical parathion is not a primary irritant. It is necessary to insist that operators take a complete shower at the end of each workday. Freshly laundered, complete work-clothing outfits are supplied the men daily by the company. Separate lockers are provided for street clothing and work clothing. Eating in the workroom is prohibited, and a separate lunchroom, removed from the operating area, is maintained.

The same emphasis on mechanical exhaust ventilation is given in the manufacture of parathion as in the cyanides. There is little danger of significant vapor exposure since the vapor pressure of parathion is relatively low at ambient temperature.

Medical control is maintained through periodic blood testing to determine cholinesterase levels of the employees, in addition to the mechanical aids to prevent exposure.

Maintenance workers must be safeguarded. Used piping and drums must be decontaminated. The prevention of exposure extends also to the control laboratory where a similar program of good industrial hygiene is maintained.

Employee Education and Deportment

All employees are thoroughly indoctrinated in the potential health hazards involved in processing economic poisons. This is done to establish a feeling of confidence so they will know how to act in any emergency.

Casual visits to these departments are not encouraged, even by employees of the plant.

The location of all persons in the department must be known at all times since, in an emergency, we want to be immediately assured they are safe. There is no time for delay in starting rescue efforts. A "buddy" system has been established, each employee being required to know the whereabouts of his partner at all times.

These precautionary methods have been very effective over the many years of manufacturing experience at our Warners Plant. On rare occasions, there have existed some temporary conditions of emergency but good deportment of the men on the job has prevented fatal accidents.

The attention given to conserving the health of men engaged in the manufacture of these economic poisons has been worthwhile. However, the manufacturer has a slight advantage in health conservation over the user. The manufacturer has a fixed installation, a group of trained chemical operators, and the availability of technical services. The user does not have a fixed installation in many cases and the training of his sprayers may be more on the basis of instilling fear rather than confidence.

In addition to technical services and literature offered by all manufacturers and the information contained on all of the warning labels of products, it is considered desirable that health agencies continue to direct their efforts toward good health practices in the manufacture and use of economic poisons.—Joseph F. Mellor, Jr., industrial hygienist, Warners Plant, American Cyanamid Co., Linden, N.J.

Food Establishment Use

Economic poisons most frequently used in food establishments are insecticides and rodenticides.

Many employ professional pest control operators experienced in the application of economic poisons and aware of the dangers from careless use of such poisons. On the other hand, proprietors of smaller food establishments may do their own pest control work.

If pest control efforts are confined to the use of registered insecticides and the instructions on the container are followed carefully, there will be little hazard of food contamination. A real danger exists, however, if insecticides and rodenticides not recommended for use in food establishments are purchased and applied in a careless manner.

As in the past, it is important to emphasize sanitation, screening, and ratproofing to re-

duce infestations by insects and rodents. Observance of such measures results in a minimum and more effective use of insecticides and rodenticides.

The use of economic poisons in food establishments has become more complex as many new pesticides have been developed. Formerly, pyrethrins, rotenone, organic thiocyanates, and sodium fluoride were the chief insecticides. Compounds of phosphorus, arsenic, thallium, and red squill were rodenticides commonly used. After World War II, many chlorinated hydrocarbon insecticides, some organic phosphate compounds, pyrethrum synergists, allethrin, and anticoagulant rodenticides appeared on the market.

These newer pesticides vary greatly in their toxicity to warmblooded animals, and some of the more toxic ones are not recommended for use in areas where food is prepared.

The importance of reading and following the directions on the labels of pesticides cannot be overemphasized. The consumer's ignorance on this subject was emphasized in a recent survey undertaken by the Chemical Specialties Manufacturers Association entitled "Do People Read Labels on Household Insecticides?" The survey showed that only between 8 and 15 percent of the people using these products were aware of the important precautions required for many years on all aerosol and liquid spray labels.

Hazards in the use of insecticides by inexperienced individuals are increased by ignorance of the cautions on labels.—Arnold Mallis, Gulf Research and Development Co., Pittsburgh, Pa.

Agricultural Residues

Our primary concern today is the unintentional chemical additives whose number is expanding at a rapid rate. Unintentional additives include pesticide residues, residues of antibiotics and hormones used for growth stimulation, traces of chemicals that cannot be avoided in good manufacturing practice, as well as residues of drug products resulting from the medication of animal feeds.

Of these, pesticide residues are the object of widespread attention. The modern history of pesticide residues began with the advent of DDT during World War II. Since then, a number of new organic materials, many of them quite specific, have been developed.

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Pesticides, by definition, are those substances which prevent, destroy, repel, or mitigate insects, rodents, and other forms of undesirable plant or animal life. In actual practice, destruction is the most common method of control.

This killing is accomplished by substances poisonous to the particular form of life. Very often these substances are deleterious to higher forms of life, including man.

Resultant illnesses in man can be classified as either chronic or acute, depending on either a high or low level of toxic material and duration of exposure. For most substances, the effect of a high level of toxicity is well established, but there is great concern and a considerable lack of knowledge regarding the toxicology of low levels. There are many unanswered questions regarding the safety of small residues appearing in food.

As examples, lindane is not recommended for use on calves under 3 months of age, on milk cows, or on animals within 30 days of slaughter. It is used, however, in electric vaporizers for fly control in restaurants and considered safe insofar as the patron is concerned. What of the waitress or busboy who works in the dining room 8 or more hours a day? We can all recall pictures of Italian and North African children being dusted with DDT for typhus, yet recently several carloads of spinach were destroyed in Chicago because of an excessive DDT residue.

Probably the most important steps forward in controlling pesticides have been those resulting from the Miller Amendment to the Federal Food, Drug, and Cosmetic Act whereby approximately 100 chemicals have been cleared for food protection and more than 1,500 individual tolerances have been established on the basis of scientific data to permit these chemicals to be used effectively and safely for the benefit of farmers and consumers alike.

The number of chemicals and individual tolerances so identified increase with every re-

lease by the Food and Drug Administration. These tolerances are in the range of 0.1 to 14 ppm for the most part. One percent is the equivalent of 10,000 ppm so these tolerances are rather small. Certain chemicals are exempt from tolerances, and for a few a zero tolerance has been set, which means that they cannot be used under conditions leaving any toxic residue whatsoever.

A series of antibiotics and hormones have been developed that stimulate growth either by direct action on the animal or plant or by the repression of bacteria, parasites, or other organisms. A majority of animal feeds today contain penicillin, chlortetracycline, or tetracycline at a level of less than 50 grams per ton, and many feeds contain a considerably higher amount.

Use of an antibiotic on raw poultry up to 7 ppm is becoming almost routine in many large processing plants. Cooking effectively destroys this chemical additive. Hormones, such as diethylstilbestrol, are fed to many steers as a part of the daily ration, although in some cases ear implants are used to supply the hormone.

The liberal use of antibiotics in humans for minor conditions is thought by some to limit their effectiveness in a real emergency. How much of a buildup is obtained a few parts per million at a time from milk and from other sources is difficult to determine.

Residues resulting from the incorporation of drugs into animal feed, especially poultry feed, appear to present no acute problems.

It is evident that control of agricultural residues requires a combination of education and cooperation, with emphasis placed on the following points. The grower must follow directions for use in both the time and rate of application, discontinuing use prior to harvest as indicated. The processor must accept only those raw agricultural commodities that fall within specified tolerances, following good manufacturing practices to reduce the amount of residue. The meat producer must stop the use of medicated feeds prior to slaughter. The dairy farmer must discard milk immediately following mastitis treatment. The baker and ice cream manufacturer must use only acceptable stabi-

lizers and emulsifiers. The confectionary maker must use only Food and Drug Administration certified colors. The food industry in general must exercise self-discipline with regard to chemical additives and pesticide residues. And the consumer must insist on adequate labeling and become more label conscious.—Delmar K. Myers, Pennsylvania State Department of Agriculture.

Home Control Activities

Limitations to current preventive measures hamper the control of accidental poisonings in the home. Some of the limitations and their solutions are:

• The tendency to categorize such accidents into groups, such as occupational, motor vehicular, and home, is conducive to duplication and overlapping of effort. Coordination among official and unofficial organizations, permitting the breakdown of artificial groupings and a free flow of information, is a "must."

 A standardization of language in the total field rather than a special jargon for each grouping is needed.

 To depend entirely on mortality data is a mistake. Morbidity data must also be collected and taken into account.

• One of the first educational efforts should be directed to eliminating "luck" as a so-called "cause" of accidents. The definite sequence of events that ends in an accident should be emphasized, showing that the negation of one of the factors in a sequence will prevent or modify the seriousness of an accident.

To date, accident preventers have attempted to accomplish their job primarily through the use of mass educational techniques. Mass education is valuable when used to create a philosophy or community awareness of the problem. It is my thought, however, that it does not cause many individuals to change their living habits or their environment. The most lasting and rewarding results will come through specific educational efforts, tailoring the message to meet the needs of small reference groups. Scheduling of periodic meetings of such small groups should be developed to revive and maintain the impact of accident prevention drives.

Historically, the control of poisonings in Pennsylvania received its initial impetus from the American Academy of Pediatrics which formed an accident prevention committee early in 1950, resolving to urge its affiliates to undertake accident prevention activities.

In 1956, the Pennsylvania Department of Health joined with the Pennsylvania Academy of Pediatrics in establishing poison treatment centers in the State's hospitals. An accident prevention unit was formed in the Philadelphia Department of Health the same year, instituting a poison information center for round-the-clock emergency service to the public. A follow-up procedure is based on home accidental poisoning cases reported to this center. A public health nurse visits the victim's home to investigate and report the cause of the accidental poisoning.

A morbidity reporting system based on hospital reports of treated accidental injuries will be put into operation shortly by the Pennsylvania Department of Health. A trained investigator will follow up these reports to explore the "how" and "why" of accidental injuries. Accidental poisonings are to be included.—Dan D. Gowings, M.P.H., director, division of environmental safety, Pennsylvania Department of Health.

Patients Served by a Mental Health Unit of a City Health Department

JACOB TUCKMAN, Ph.D., and MARTHA LAVELL, M.S.S.

THE RECOGNITION of the public health **L** aspects of mental illness has led to the establishment of mental health units by an increasing number of public health departments. Such units perform many functions which vary in scope and emphasis with the needs of the community and the degree of public support. These functions may include planning and coordination of mental health services, consultation to public and private agencies, inservice training, mental health education, casefinding, surveys, research, and direct services to individuals with mental health problems. Such direct services are usually limited to children but may include adults and special groups such as alcoholics.

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Little is known about the characteristics of patients who come to the attention of mental health units of public health departments. The purpose of this study, therefore, was to obtain certain information about individuals known to the division of mental health of the Philadelphia Department of Public Health during the period 1955–57, its first 3 years of operation. Although there are gaps in the data, such material may be useful to health departments contemplating the establishment of mental health units or to already established units as a basis for comparison.

The services provided by the division, available to anyone in the community, include diag-

nostic evaluation and psychiatric treatment of children, adolescents, and adults; and consultation, information, and referral services directly to the patient or to responsible relatives, interested individuals, or agencies acting on his behalf. In selected cases, psychiatric evaluation and treatment on a continuing basis are available to individuals in their own homes.

Patient Data

During the 3-year period the division served 1,734 persons. Information about these patients was obtained from the case record, frequently limited to pertinent material noted on a 5- by 8-inch card. Data about the characteristics of the patient had not been gathered routinely because contact with the patient or a responsible relative was for brief periods or was limited to telephone contacts or because of the pressures on an overburdened staff. The material collected from the records was coded and transferred to punched cards.

Of the 1,734 individuals studied, 39 percent were male and 61 percent female. A breakdown by race shows 37 percent were white, 22 percent nonwhite, and 41 percent whose race was not stated. Since the proportion of nonwhites in the Philadelphia population has been estimated to be 24 percent (I), it seems probable, considering the large number of those whose race was not stated, that nonwhites were over-represented in the patient population.

The number of patients served varied with place of residence. Using 1957 estimated population figures for Philadelphia (1), rates were calculated for the 10 health districts into which the city is divided. They varied from 19.2 to

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160.5 per 100,000. Health districts with high rates tended to be areas with high mortality and delinquency rates, substandard housing, and low income. Three percent of the total group resided outside of Philadelphia.

Only a very small percentage of the patients (7 percent) were without a responsible relative. Almost three-quarters (72 percent) had one or more close relatives, but this did not always mean that the relatives were willing or able to assist them. In 21 percent of the cases no information was available regarding the existence of a relative.

The age distribution of the patients ranged from a few weeks to 96 years (table 1). Of the total group, 11 percent were under 15 years, 7 percent between 15 and 24, 23 percent between 25 and 44, 18 percent between 45 and 64, and 19 percent 65 years of age and over.

In 22 percent of the cases, the actual age of the patient was not stated, but it was possible to estimate from the case record the age of most of these patients: 4 percent were children, 73 percent were adults, and an additional 21 percent were known to be older adults. For purposes of analysis, these cases were combined with those with ages specified in the following manner: children without a specified age were considered to be under 18 years; adults were considered to fall within the 18- to 64-year age range; and older adults were considered to be 65 or older.

Such an age grouping seemed reasonable in view of the special problems of children and the aged, both of whom tend to be dependent upon others for their agency contacts. Com-

Table 1. Age distribution of 1,734 patients served by the division of mental health, Philadelphia, 1955–57

Age group, in years	Per- cent	Age group, in years	Per-
Under 5		50-54	
5-9	3	55-59	
10-14	3	60-64	
15-19	4	65-69	
20-24	3	70-74	
25-29	5	75-79	
30-34	6	80-84	
35-39	7	85 and over	
40-44	5	Not stated	2
45-49	4		_

parisons with general population figures for Philadelphia showed that children were underrepresented (15 percent in the patient population and 27 percent in the general population), adults were about equal (62 percent and 65 percent, respectively), and older adults were overrepresented (23 percent and 8 percent, respectively).

There were significant differences between the sexes in the age distribution. The children included 10 percent of the females compared with 18 percent of the males; the older adults, 19 percent of the males compared with 26 percent of the females.

Sources of Referral

Patients were referred to the division through many different channels, representing 87 unduplicated types of referral source (table 2). Twenty-seven percent were referred by medical sources, such as various divisions of the health department, general hospitals and clinics, and psychiatric hospitals and clinics.

Nonmedical city and State agencies referred 25 percent: 10 percent from such sources as the mayor's office of information and complaints, department of public welfare, licenses and inspection, personnel department, commission on human relations; 7 percent from law enforcement agencies such as courts, district attorney's office, police department including the juvenile aid bureau, and prisons; and 8 percent from State agencies such as the department of public assistance, department of welfare (bureau of aging services, bureau of hospitals, and State council for the blind), bureau of rehabilitation, and the board of parole.

Fourteen percent were referred by voluntary agencies concerned with child care and protection, financial assistance including shelters, nursing services, employment, rehabilitation, legal aid, and services for special groups such as the blind, prisoners, and transients. In 15 percent of the cases, the patient was referred by himself or his family. Eleven percent were referred by various interested persons including friends, neighbors, politicians, councilmen, lawyers, and landlords. Four percent were referred by miscellaneous sources including private nursing homes, employers, churches, labor

Table 2. Percentage of patients served by the division of mental health, Philadelphia, 1955–57, according to referral source

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Referral source	Under - 18 years (N = 256)	18-64 years (N= 1,061)	65 years and over (N = 398)	Total ¹ (N= 1,734)
Medical facilities: Health depart- partment	43	7	5	12
General hospitals				1
and clinics Psychiatric hos- tals and	8	11	8	10
clinics Out-of-State psy-	4	4	3	4
chiatric hospi- tals City and State agen- cies (excluding medical):	0	1	1	1
Law enforcement agencies	14	6	5	7
Other city depart- ments State agencies	7	10 7	13 17	10
Voluntary welfare agencies	4	17	10	14
Schools	4	(2)	0	1
Self or family Other interested persons:	10	18	12	15
Friends, neigh- bors	2	5	7	5
Councilmen, politicians	(2)	1	9	9
Lawyers	(2) (2)	2	$\frac{2}{2}$	2 2 2 4
Landlords	0	1	4	2
Miscellaneous Not stated	(2)	4 5	6 4	4

¹ Includes 19 cases not classifiable by age.

Note: $\chi^2=406.60$; df=20; P<.001 (for the χ^2 analysis, psychiatric hospitals and clinics were combined with out-of-State psychiatric hospitals; other interested persons were combined with schools).

unions, Federal agencies (Army recruiting station, Bureau of Old-Age and Survivors Insurance, Housing Redevelopment and Relocation), chamber of commerce, American Legion, and others.

Significant age differences were found with respect to referral source. Health department referrals accounted for 43 percent of those under 18 years compared with 7 percent of those between 18 and 64, and 5 percent of those 65 and older. These findings were not unexpected in view of recent program developments in the division focusing on preschool

children seen in child health conferences at local health centers. Referrals from law enforcement agencies also accounted for a higher proportion of those under 18 years than of those in the two categories of adults, probably because such agencies are more likely to use community resources for children and adolescents than for adult offenders. Persons 65 and older were more likely than the other age groups to be referred by State agencies other than hospitals (primarily the department of public assistance), and persons between 18 and 64 years were most likely to be referred by voluntary welfare agencies.

The difficulties for which help was sought covered a wide range. Among the children were some who were not developing normally or who presented other problems of management, others with difficulties in school adjustment, and still others who had had a brush with the law.

The adults presented psychiatric problems of varying degree. In some cases the psychiatric problem contributed to marital difficulties. Some patients exhibiting paranoid tendencies appeared periodically at the mayor's office of information and complaints, at the police department, and at other public and private agencies demanding restitution or protection. Other mentally ill persons created public health or fire hazards by throwing garbage out of windows or accumulating trash. Some created a public nuisance by quarreling with or taunting their neighbors. In some cases the mentally ill person constituted such a potential danger to himself or to others that it was necessary in the absence of a responsible relative or interested agency to petition the court for psychiatric examination.

Some patients were public assistance clients for whom the agency requested evaluation of mental competency because there was a question about their ability to handle funds. Many patients were older persons who presented a variety of problems involving an impairment of their ability to maintain themselves economically, psychologically, physically, and socially.

One small group of patients in the most urgent need of hospitalization had been placed in jail because of the shortage of hospital beds. This practice has been terminated through

² Less than 0.5 percent.

new program. A small number of patients had recently been discharged from a mental hospital and needed help with employment, housing, social contacts, or psychiatric care on an outpatient basis. In a few cases social history data were required by a State hospital to help in planning for the patient or determining whether the home was ready to receive him.

Contacts and Outcome

The type of contact with the patient is shown in table 3. In half the cases (48 percent) contact with the patient or on his behalf was by telephone or correspondence or both; such contacts included information, referral, and consultation services. These contacts were not necessarily of short duration, since extensive exploration was often necessary to locate the appropriate community resource. In 24 percent of the cases, patients were interviewed in the division's offices or in health centers, usually by a psychiatric social worker but also by a psychiatrist or psychologist. Office contacts demanded more intensive work in clarifying the problem and in helping the patient and family accept referral for psychiatric help.

In 21 percent of the cases, visits to the pa-

Table 3. Percentage of patients served by the division of mental health, Philadelphia, 1955–57, according to type of contact

Type of contact	Under 18 years (N = 256)	18-64 years (N= 1,061)	65 years and over (N= 398)	Total ¹ (N = 1,734)
Telephone contact or correspondence or both Office interviews 2	53 20	46 28	48 15	48 24
Home visits: By psychiatric social worker	8	16	25	17
By psychiatrist By both Diagnostic testing or individual or group psycho-	(3)	2 2	3 3	, 2
therapy or both 4 Not stated	11 7	1 5	(3) 5	6

¹ Includes 19 cases in which age was not stated.

² May include telephone contacts or correspondence.

3 Less than 0.5 percent.

With or without home visits.

Note: $\chi^2 = 170.70$; df=8; P < .001.

Table 4. Percentage of patients served by the division of mental health, Philadelphia, 1955–57, according to length of contact

Length of contact (in days)	Under 18 years (N=256)	18-64 years (N= 1,061)	65 years and over (N=398)	Total ¹ (N = 1,734)
1	29	36	35	38
2-6	11	15	18	18
7-13	7	8	11	8
14-20	6	5	6	(
21-29	5	6	5	(
30-59	8	11	11	11
60-89	6	4	4	4
90-119	2	3	2	2
120-149	1	1	1	1
150 and more	12	4	3	
Not stated	13	6	4	7

¹ Includes 19 cases not classifiable by age.

Note: $\chi^2 = 53.72$ (omitting contribution of not-stated cases); df = 20; P < .001.

tient's home were necessary, usually by psychiatric social workers, but in some cases by a psychiatrist, whose medical opinion was required regarding the mental competency of the patient. In some cases it was necessary for both psychiatric social worker and psychiatrist to make the home visit. In 2 percent of the cases, contact included diagnostic psychological testing or individual or group psychotherapy, or both, with or without a home visit.

There were significant age differences in type of contact. Home visits were required most for older adults, less for younger adults, and least for children. By contrast, such services as diagnostic psychological testing and psychotherapy were limited almost entirely to children, reflecting program emphasis.

There were also significant differences between the sexes in type of contact. Twenty-four percent of the women compared with 15 percent of the men required home visits.

Length of contact with the patient varied from 1 day to more than 5 months (table 4). The 1-day contacts generally were limited to telephone calls or an office visit. The longest contacts were with patients requiring more extensive psychiatric casework assistance or psychotherapy on a continuing basis. In 50 percent of the cases, contact with the patient lasted less than 1 week. In 20 percent of the cases contact was maintained from 1 week to 29 days,

in 18 percent from 1 to 5 months, and in 5 percent for 5 months or more. Persons receiving service for at least 5 months were more likely to be children.

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Outcome of contact with the patient is shown in table 5. Thirty-three percent of the cases were closed after information had been given regarding psychiatric resources or procedures, or after a referral had been made to a specific community resource, contacted by the division for this purpose. Five percent of the patients were referred to ancillary resources such as nursing homes and family, employment, and group work agencies. Seven percent of the patients were advised that a community resource which had previously served them would be more helpful to them.

Sixteen percent of the cases were closed after service had been completed for the public or private agency currently active in the situation. Most of these cases involved consultation and advice in meeting the patient's psychiatric

Table 5. Percentage of patients served by the division of mental health, Philadelphia, 1955–57, according to outcome of contact

Outcome	Under 18 years (N= 256)	18-64 years (N= 1,061)	65 years and over (N= 398)	Total ¹ (N=1,734)
Information given re psychiatric re- sources or proce-				
duresReferred to psychi-	10	17	20	16
atric resources	19	17	15	17
Referred to ancillary resources	4	4	8	5
Encouraged to seek psychiatric helpPetitioned court for	2	10	5	8
psychiatric examinationPatient or family	(2)	2	4	2
refused help Service completed	27	12	7	13
for public or vol- untary agency Directed back to re-	16	16	15	16
source previously involved No further contact	5	7	9	7
required, other Not stated	$\begin{bmatrix} 12 \\ 4 \end{bmatrix}$	$\begin{array}{c c} 14 \\ 2 \end{array}$	17 1	1.4

¹ Includes 19 cases not classifiable by age.

problem, but in some cases a supplementary service was performed, such as a home visit to determine mental competency.

In 13 percent of the cases, the patient or family refused help; in another 8 percent, the patient or family or both, were encouraged to seek psychiatric help, but the record contained no information that they had done so. Two percent of the cases were closed after the division had petitioned the court for psychiatric examination. In 14 percent no further contact was required for various reasons; the patient had shown improvement through extended casework or through individual or group psychotherapy, had died, disappeared, been sent to jail, had broken contact, or did not present a psychiatric problem.

There were significant age differences with respect to outcome of contact. A higher proportion of children than adults or older adults refused help; while a higher proportion of both adult groups than children was given information about psychiatric resources and procedures.

Discussion

Although the 1,734 patients served by the division of mental health during the first 3 years of operation included persons of all ages, children were under-represented and older adults over-represented by comparison with general population figures. The reason for this fact was that much of the work of the division in its early years was necessarily devoted to meeting the needs of chronic patients, since facilities in the community for the care and treatment of the mentally ill were inadequate. With the development of new programs and increased facilities, however, there has been a reduction in the backlog of mentally ill persons with unmet needs, making possible a greater emphasis on preventive work with children.

It might be expected that the major channel of contact for patients would be through the private and public health and welfare organizations. However, more than 40 percent of the patients came to the division through other sources, and almost all of these were appropriate referrals. This suggests a considerable degree of sophistication on the part of lay per-

² Less than 0.5 percent.

Note: $\chi^2 = 119.32$; df = 18; P < .001.

sons and organizations in recognizing psychiatric problems.

The study presents useful information about some characteristics of patients served by a mental health unit. Unfortunately, there were gaps in data on race, religion, marital status, and occupation. Although more information was available for patients seen face-to-face than for those served by telephone or correspondence, the gaps in data on the former group were too great to permit statistical analysis. In-

formation on the factors previously mentioned and others such as income, amount of schooling, mobility, and previous psychiatric care is essential for a better understanding of the patient load, and for program planning and improvement of services.

REFERENCE

 Division of Statistics and Research, Philadelphia Department of Public Health: Annual report, public health statistics. Philadelphia, 1957.

Career Opportunities

Columbia University and the Institute for Crippled and Disabled will conduct a work conference June 8–26, 1959, on the roles of medicine, counseling, psychology, and social work in a vocationally oriented rehabilitation center. The conference is supported by a grant from the Office of Vocational Rehabilitation, Department of Health, Education, and Welfare. Enrollment is limited to professional workers in the field of rehabilitation.

Yale University Department of Public Health offers for the academic year 1959–60 a new program designed to prepare nurses for positions in supervision, education, and consultation in chronic illness nursing. Funds for the course were made available through the Connecticut State Department of Health by a graduate training grant from the National Heart Institute of the Public Health Service.

The program covers a minimum of one academic year for students with advanced experience and training and leads to the degree of master of public health with a major in chronic illness nursing. Admission requirements include a bachelor's degree, graduation from an approved school of nursing, and experience in public health or teaching.

The University of Minnesota School of Public Health offers the second annual workshop on air pollution July 6-17, 1959.

Designed for engineers, physicians, chemists, and sanitation personnel concerned with community air pollution from the educational, governmental, or industrial viewpoint, the course will consist of lectures, demonstrations, field trips, and the application of fundamental knowledge in solving the air pollution problem

of a community. Enrollment is limited to 25. Applications may be filed with the University's School of Public Health, 1325 Mayo Memorial Building, Minneapolis 14, Minn.

The University of Minnesota has also announced a summer continuation course of instruction in chronic diseases, July 27 through August 22, 1959. The course is presented with the cooperation of the schools of public health of the United States and the Conference of Chronic Disease Training Program Directors as a non-academic-credit program in chronic diseases on the graduate level for physicians in health agencies and research workers in the medical sciences.

Subject areas are epidemiological methods in noninfectious diseases, recent advances in experimental and clinical aspects of heart disease and cancer, and public health chronic disease control programs with emphasis on heart disease.

Further information may be obtained by writing to Dr. Leonard M. Schuman, Professor of Epidemiology, School of Public Health, at the university.

Teachers College, Columbia University, will hold a work conference on the sheltered workshop as a community resource in the vocational rehabilitation of mentally retarded adolescents and adults July 27 through August 14, 1959, under the sponsorship of the Association for the Help of Retarded Children, Inc.

Information may be obtained from Dr. Abraham Jacobs, Box 35, Department of Psychological Foundations and Services, Teachers College, Columbia University, New York 27, N.Y.

An annual report in a series begun by the Communicable Disease Center in 1955, summarizing the findings of its nationwide surveillance activities.

Arthropod-Borne Encephalitis in the United States, 1957

JACOB A. BRODY, M.D., and WALTER A. MURRAY, Jr., M.D.

ENCEPHALITIS virus activity decreased in 1957, according to reports from epidemiologists of 46 States to the Communicable Disease Center, Public Health Service. Eastern encephalitis (EE) epizootics occurred in the Gulf States and as far north as South Carolina, but only five confirmed human cases came to our attention: two in Florida and three in Louisiana (fig. 1). Minimal virus activity was recorded in New Jersey and Massachusetts.

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Western encephalitis (WE) virus activity was prominent only in the Mountain States in 1957, with California and Texas registering few cases (fig. 1). The majority of the reported human cases were centered about a small outbreak in the Denver, Colo., area.

The major public health problem in 1957 among the arthropod-borne diseases in the United States continued to be St. Louis encephalitis (SLE), with the bulk of cases in

Texas and California (fig. 1). Florida registered its first proved case, the only geographic extension of the North American arthropodborne encephalitides beyond previous historical limits (1). The sizable outbreak of SLE occurring in the lower Rio Grande Valley appears to be the only major concentration of human cases of encephalitis in 1957.

Data Collection

Since 1955 information has been collected from State and local health departments, medical and veterinary virus diagnostic laboratories, the Disease and Eradication Division of the U.S. Department of Agriculture, and other sources.

Most of the appraisal of the 1957 data was carried out by the epidemiologists, laboratory directors, and public health veterinarians in State health departments. The National Office of Vital Statistics of the Public Health Service gave statistical advice, and cooperation was afforded by virus laboratories of several academic institutions, the National Institutes of Health Rocky Mountain Laboratory at Hamilton, Mont., the Walter Reed Army Institute of Research, Washington, D.C., and the Fourth U.S. Army Medical Laboratory in Dallas, Tex. Continued mutual exchange of data in 1957 resulted in four concurrent seasonal reports

Dr. Murray serves as assistant chief of the Surveillance Section, and Dr. Brody as intelligence service officer assigned to that section in the Epidemiology Branch of the Communicable Disease Center, Public Health Service, Atlanta, Ga. Dr. Alan W. Donaldson, assistant chief of operations, and Dr. Mario Pizzi, chief of the Surveillance Section at the Center, aided in the compilation of the data; and Ida L. Sherman, of the Center's Statistics Section, gave statistical assistance.

Table 1. Human cases of encephalitis, by State, in 1957

		Case	es apprais	ed as arth	ropod-bo	rne encepl	halitis	
State	Report data 1	I	EE	1	WE	s	LE	Fatal cases
		Con- firmed	Pre- sump- tive	Con- firmed	Pre- sump- tive	Con- firmed	Pre- sump- tive	
Maine_ Massachusetts_ Rhode Island_ Connecticut_	8 23 13 8							
New York New Jersey Pennsylvania	272 24 25							
Ohio	74 76 130 84 23							
Minnesota Iowa Missouri North Dakota South Dakota Nebraska Kansas	2 13 15 37 5 7			1 1		1		
Maryland District of Columbia Virginia West Virginia North Carolina South Carolina Georgia Florida	33 29 10 53 5 55 15 17 24	2			4			
Kentucky Tennessee Alabama Mississippi Arkansas	50 16 22 25		1			4		
Arkansas Louisiana Oklahoma Texas	$\begin{array}{c} 11 \\ 4 \\ 23 \\ 196 \end{array}$	3		7		61	78	2 3
Montana Wyoming Colorado New Mexico Arizona Utah Nevada	8 3 67 6 5 10			1 1 22 2 1		4		3 1
Washington Oregon California	14 52 542			3		23		3 2
Total	2, 135	5	1	39	4	95	85	6

¹ Reported Incidence of Notifiable Diseases in the United States, 1957, Morbidity and Mortality Weekly Report, Annual Supplement, vol. 7, No. 53, National Office of Vital Statistics, Public Health Service.

 $^{^{2}}$ One confirmed case and two presumptive cases of St. Louis encephalitis. 3 Confirmed.

and an annual summary report, which form the basis of information for this presentation.

Eastern Encephalitis

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Five confirmed human cases of eastern encephalitis paralleled the reported occurrence of cases in horses in both early seasonal occurrence and geographic distribution, with the exception of an unusually early onset (February) in one of the two cases in Florida (table 1). The Florida patients recovered with very severe sequelae, whereas two patients in Louisiana recovered completely, but a third in that State was the only death reported. A presumptive case of EE was reported from McCracken County, Ky., in an 8-year-old girl who recovered, with persistent hemiparesis.

Information from the southern States revealed a prolonged seasonal incidence among horses, confirmed cases occurring from May through September. The clinical course of the disease in affected horses was characteristically violent, terminating in death in 24 to 48 hours. In all, 28 virus isolations were made from horse brains submitted to four laboratories from five States (table 2).

Ecological studies in Baldwin County, Ala., yielded the only virus isolation from mosquitoes in 1957 (2). A small endemic focus was suggested by isolations of virus from a number of species of wild birds and mosquitoes over a period of several months.

In contrast with 1955 and 1956, EE in pheasants was rare. The disease was evident in one captive pheasant flock in southern New Jersey in late September. One virus isolation was made. Although no reported cases in horses and pheasants occurred in Massachusetts, evidence of minimum virus activity was indicated in study areas by virus isolations from one wild and two sentinel pheasants, and the presence of antibodies in immature chickens, turkeys, starlings, and swine. From this area, the first human biting record for *Culiseta melanura* in a natural setting was established in September 1957 (3).

Similar ecological studies were conducted in Florida, Georgia, and South Carolina. In Georgia and South Carolina, antibodies were demonstrated in wild birds and immature feral swine, although no virus was isolated from mosquitoes, small mammals, or fowl. Negative

Figure 1. Geographic distribution of the arthropod-borne encephalitides in man, horses, birds, and mosquitoes in the United States, 1957.

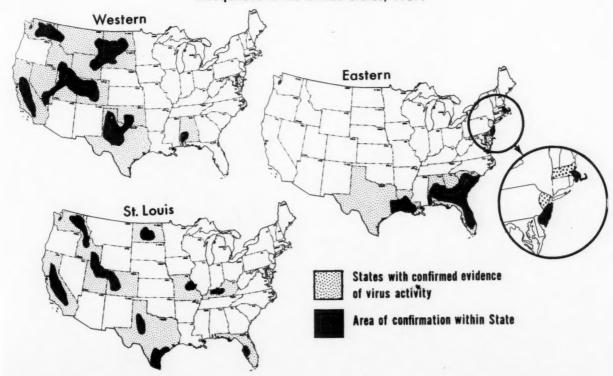


Table 2. Reported encephalitis cases in horses, by State, in 1957

State	Re- ported cases ¹	Total deaths ¹	Virus isola- tion ²	Serol- ogy ³
New Jersey	2	2		
Indiana Illinois Wisconsin 4	4 14 4	6		
Minnesota Iowa Missouri North Dakota South Dakota Nebraska Kansas	15 2 4 9 58 77 28	18 22 1		
Delaware North Carolina South Carolina Georgia Florida	$\begin{array}{c} 2 \\ 14 \\ 59 \\ 83 \\ 368 \end{array}$	2 14 38 67 237	4 7 5	
Tennessee Alabama Mississippi ⁴	$\begin{array}{c} 8 \\ 67 \\ 3 \end{array}$	8 64 3	5	
Arkansas Louisiana Oklahoma Texas	5 92 13 133	5 85 2	7	3
Montana_ Idaho Wyoming Colorado New Mexico Arizona ⁴ Utah	34 79 16 80 69 18 77	14 3 9 17		3
Washington Oregon California	36 36 16	7 2		5
Total	1, 525	639	28	41

Data from Animal Disease Eradication Division,
 U.S. Department of Agriculture.
 All eastern encephalitis.
 Western encephalitis.
 Four cases from these States were confirmed, but the test system is not known.

antibody and viral findings from a study in Florida are equally important epidemiologically.

Western Encephalitis

About 40 confirmed human cases of WE occurred in 1957, as in each year since 1955, when routine surveillance of encephalitis began. For the first time, however, the majority of cases emanated from a single epidemic, a small outbreak in Denver, Colo. Data from minor foci,

which cover a more restricted geographic area than in previous years, are presented in table 1.

About half of the human cases that occurred in Colorado were in the Denver area. Cases occurred from mid-July to the first of October. Although more than 100 clinical cases were reported, laboratory confirmation was obtained for only 22. The age pattern of these confirmed cases conforms closely to the national experience over recent years, with almost 50 percent of the cases occurring in infants (table 3).

Table 3. Age distribution of confirmed encephalitis cases, 1957

Age group,	in	y	e	aı	S							I	3]	E		WE	SLE
0-1					_				_							12	4
1-4														1		4	E
5-9													1	2	2	3	(
10-14										-						3	5
15-19									_	_	-		-	5)		
20-29	-	-		-	***			-	***	-				1			20
30-39				-	-		-	-	-	-				-		2	1.
40-49			-	-	-	-	-	-	-	-	-		-			2	- 5
50-59		-	-	-	-	-	-	-	-	-	-	-		-	-	1	
60-69		-		-	-)	-	-	-	-	-	-	-	-	-	-		
70 70		-		-	-				-	***	-	-	-	-	-	3	2
70-79	-	-	- 9	- int					-	-	-	-			-	9	
		-		-	-		-	*	-	-	-	-					11
Unknown				-		-		-	-	100	-	, right 1			-	9	1.
Total								_						11.	,	39	98

¹ One case was presumptive.

The disease in horses was concentrated mainly in an area extending from the northwestern corner of Utah up through Idaho to the western portions of Oregon and Washington. Very few human cases were noted in these areas. Sporadic cases also occurred in the Dakotas, Montana, Wyoming, and Nevada.

Although close surveillance of encephalitis was continued in California in 1957, only three cases of WE were confirmed and one of these possibly originated outside the State (4). One of the patients, a 3-year-old boy, became ill on March 23, which is the earliest known date of onset recorded in the State.

Since WE is not particularly lethal to horses, virus isolations are infrequent. All confirmed cases in horses in 1957 were proved by serologic methods; they occurred in California, Colorado, Oklahoma, Utah, Washington, Wisconsin, Oregon, Arizona, and Mississippi.

In several States large numbers of mosquito pools, primarily *Culex tarsalis*, were examined for virus. Most investigators processed pools of 50 mosquitoes.

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The results reported for 1957 by the California State Department of Public Health are compared with results in the State for other years, where similar techniques in collection were used (4):

Isolations	1954	1955	1956	1957
Pools tested	989	1, 113	1,047	920
Pools positive	238	82	145	93
WE virus	151	68	143	44
SLE virus	87	14	2	49

Some 65 pools of *C. tarsalis* were positive for WE in collections from the Denver and Greeley areas. From 5 to 20 pools were positive among those tested from Texas, Idaho, North Dakota, and Washington. All isolations were from pools of *C. tarsalis* except the pools of *Culex quinquefasciatus* from Cameron County, Tex.

Western encephalitis made a late seasonal appearance in the region of Baldwin County, Ala., where eastern encephalitis is known to be endemic. In late October and November, three isolations were made from pools of *C. melanura* and three from wild birds.

St. Louis Encephalitis

After an interval of 2 years, SLE returned during 1957 in epidemic force to the Rio Grande Valley of Texas. The disease occurred for the second consecutive year in the high plains region also, but to a much lesser extent.

The outbreak in Cameron County, Tex., with some 119 clinical cases, was fairly classic for SLE. The area is semitropical, with an unusually large wild bird population. After a period of heavy rains, a long drought provided ideal conditions for the emergence of numerous *C. quinquefasciatus* mosquitoes. Cases began occurring around mid-July, reaching a peak during the last week in July and the first week in August. By the end of the month no new cases were being reported.

The attack rate was 160 cases per 100,000 inhabitants for the entire area, with considerable local variations. Harlingen was the major

urban center affected. The attack rate there was about 140 per 100,000.

The distribution by age and sex did not differ from other SLE epidemics in this area east of the Rockies. Cases occurred in all age groups, with the greatest concentration between 21–40 years of age (51 cases), but the highest attack rate occurred among persons over 60. large number of men between 21-40 years who became ill is partially explained by the age distribution of the population which is affected by the proximity of an Air Force base and the employment of numerous braceros. There were three deaths: two men, ages 60 and 84, and one woman, age 86. A total of 42 cases were serologically confirmed in two laboratories as SLE by fourfold or greater rise in complement fixation antibody.

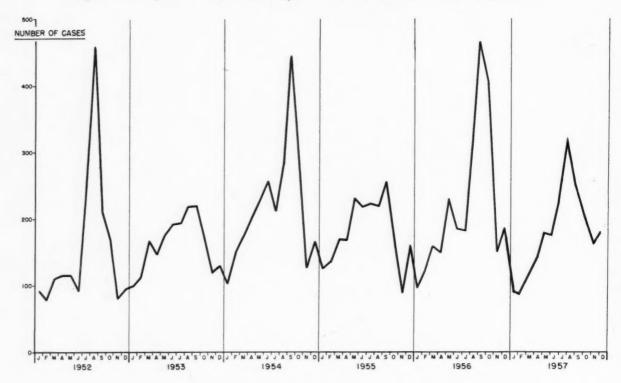
During the outbreak, control measures were instituted by State, local, and military and other Federal agencies. These were directed principally toward a large-scale dusting campaign, using a 3 percent gamma isomer of benzene hexachloride ($C_6H_6Cl_6$).

In California, confirmation of 23 cases of SLE from 11 counties was reported. The age distribution of the patients was quite similar to that in previous years, with eight below age 10 and nine over age 30. This distribution is higher than for WE in this area, where more than two-thirds of the cases are in infants and children, but lower than for SLE cases occurring east of the Rockies, where more than two-thirds were in adults. Virus isolations from C. tarsalis pools revealed 49 recoveries, as compared with 2 in 1956.

In Colorado, where SLE predominated in 1956, only four cases were confirmed, but these were of unusual interest as all but one occurred in infants, paralleling the age pattern in the larger WE epidemic in that State. Four confirmed cases were registered in Kentucky, two of which occurred in Jefferson County, the site of a sizable urban outbreak in 1956. Perhaps even more significant was a single case from Clayton County, Mo., which is the first proved case, to our knowledge, in the St. Louis area in many years. There was also a strongly presumptive case in Illinois.

The single case of SLE that occurred in Florida in a 21-year-old man was unique. It





is the first report of this disease entity in the State and the first diagnosis made by virus isolation from cerebrospinal fluid. Isolation of SLE virus from body fluids has been successful only once previously, in 1946 from peripheral blood (5).

Indicative of a persistent low level of SLE virus activity in other areas were isolations of the virus in pools of unengorged *C. tarsalis* mosquitoes in North Dakota, Idaho, Colorado, and Washington. A pool of engorged *Culex pipiens* mosquitoes collected from a chicken coop in the vicinity of two human cases in Bullitt County, Ky., provided further verification of virus activity in that area.

National Case Reporting

The monthly incidence of acute infectious encephalitis in humans for 1957 has been compiled from weekly morbidity reports submitted by States to the National Office of Vital Statistics. Comparison with corrected final monthly totals of reported cases for recent years indicates a lower third quarter peak for 1957

than for 4 of the past 5 years (fig. 2). This total represents all reported cases of post- and para-infectious encephalitis and lymphocytic choriomeningitis along with the arthropod-borne encephalitis. Although many cases in 1957 reported as encephalitis were later shown to be aseptic meningitis, the total of 2,135 cases is below that of the previous 3 years. In 1956 the figure was 2,624. Table 1 gives figures of acute encephalitis by State, as well as confirmed cases and deaths from arthropod-borne encephalitis.

The 1,525 cases in horses, with 639 deaths reported by States to the U.S. Department of Agriculture (6), was the largest number of encephalitis cases in equines reported since 1953 (table 2). As for the past 3 years, about one-half of the reports on horse cases were from the east coast, where there are proportionately smaller numbers of horses. This may be partially a reporting artifact since EE prevalent in the area is 90 percent fatal and therefore well reported. The milder course of western encephalitis in horses, as reflected by a low case fatality rate, may fail to stimulate reporting of this dis-

ease in large horse populations of the western United States.

Discussion

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Control and ultimate eradication of arthropod-borne encephalitis is dependent to a large extent on the gradual accumulation and interpretation of information. While few human cases occurred in 1957, the viruses were widely dispersed throughout nature. By means of active surveillance, certain general trends and findings have become apparent.

Only five cases of EE appeared in humans in 1957, while a large epizootic occurred among horses in the Gulf States. Human cases were confined to Florida and Louisiana. Only one death occurred among these cases, which is consistent with the finding that this disease is somewhat milder in the Gulf States than in Massachusetts, the other major area of concentration of EE cases.

Evidence is accumulating that *C. melanura* is the most important vector in the avian-mosquito cycle of EE. Whether this mosquito is the vector for human cases is not clear, although the first human biting record for *C. melanura* in nature was obtained during 1957.

As would be expected in a mosquito-borne disease, weather apparently influenced virus activity. From North Carolina northward very little rain fell during 1957 and there was almost no virus activity. A major epizootic, however, occurred along the Gulf. In 1956, when rain was plentiful in New England, the virus was considerably more prominent.

While most of the human cases of WE were centered about the Denver area, horse cases and virus isolation from birds and mosquitoes clearly indicate that this disease is very widespread in nature. Cases in humans continue to occur predominantly among infants. Evidence from studies in California (7) indicates that younger cases are most likely to have sequelae. When one considers that an increasing area in the United States comes under irrigation each year and that the extremely efficient vector *C. tarsalis* is becoming more abundant, the magnitude of the potential hazard of WE is demonstrated.

Since the first epidemic of SLE in St. Louis

in 1933, this disease has appeared periodically in epidemic form. The epidemic in Cameron County, Tex., in 1957 was typical of the disease. SLE virus, like that of WE, occurs widely throughout nature.

The factors maintaining these viruses in nature and the sudden precipitation of epidemics are being studied intensively. One fact which seems to be emerging is that large epidemics of SLE are preceded by periods of heavy rain, followed by drought. This cycle apparently favors the breeding of the major vector *C. quinquefasciatus-pipiens*, which breeds best in still water with a high concentration of inor-

ganic salt and organic materials.

Investigations continue on the mechanism of overwintering of the virus and the biology of the mosquito vectors. The possible role of mammals as hosts for the virus and the migratory pattern of birds and their nesting habits in relationship to virus activity are also being studied. In the laboratory, levels of viremia of possible hosts and their infectivity for possible vectors are being elucidated. In the field, the value of predicting epidemics by periodic collection of mosquitoes for virus isolation and regular bleeding of sentinel birds to detect the introduction of the virus into an area are being tested, while the prognostic use of meteorological data such as ground and air temperature and rainfall are under investigation. problems are varied and diffuse, but experience in 1957 slowly brings us a step closer to the goals effective control of arthropod-borne encephalitis.

Summary

During 1957, surveillance of arthropodborne encephalitis revealed fewer cases of the diseases than for the previous year among humans and more plentiful cases among horses. The only major epidemic was an epidemic of SLE in Cameron County, Tex. Five cases of EE in humans were reported, and an epizootic among horses occurred along the Gulf States. Human cases of WE were centered about the Denver area, while the sum of virus activity in man, animals, birds, and mosquitoes, for both SLE and WE, was widely distributed throughout the country. SLE continued to be the major public health problem among the arthropodborne encephalitides, with the epidemic occurring in Texas and confirmed cases occurring in six other States.

Several advances toward ultimate control of these diseases were made by better understanding of host and vector potentialities and the influence of meteorological conditions on viral spread.

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Anticancer Drug Development

For the first time, a pharmaceutical firm has been contracted by the Public Health Service to develop, test, and manufacture antibiotics and related drugs for the treatment of cancer. The award, which runs until the end of 1959, was made by the Service's Cancer Chemotherapy National Service Center at the National Cancer Institute, to the Upjohn Co. of Kalamazoo, Mich.

Drugs found safe in research by the company will be evaluated in clinical trials under the direction of the service center. If the results indicate the drugs are of real value, the company is obligated to undertake their production.

Terms of the contract are in line with the new patent policy of the Department of Health, Education, and Welfare, which permits a contractor to patent and sell drugs or other chemical agents developed under contract with the Government. However, if the manufacturer fails to supply adequate quantities to meet the public need, the Surgeon General of the Public Health Service may license other firms to produce the drug.

publications

Health Statistics From the U.S. Na- Department of State and publicational Health Survey. Hospitalization: patients discharged from short-stay hospitals, United States, July 1957-June 1958. PHS Publication No. 584-B7; 1958; 40 pages; 30 cents.

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Estimates of discharges and hospital days, percentage distributions, rates per 1,000 persons per year, and average length of stay are shown for four major characteristics: age, sex, hospital ownership, and type of hospital service.

The report also presents data dealing with socioeconomic variables, length-of-stay intervals, conditions for which the patients were hospitalized, and number and type of surgical cases. Appendixes carry technical notes on methods and give definitions of terms.

Salaries of State Public Health Workers, August 1958. PHS Publication No. 647; 1958; 41 pages.

Data in this report, taken from State and Territorial health department payrolls, include salaries of health officers, program directors, and various occupational groups.

Graphs and tables show distributions by State or by Bureau of the Census region.

Social Security Programs Throughout the World, 1958. Social Security Administration Publication (Unnumbered); 1958; 115 pages; \$1.

Intended to provide complete and up-to-date information, this report summarizes social security programs, including financial provisions, in 78 countries. It discusses old-age, invalidity, survivors, health, maternity, unemployment, and work injuries insurance as well as family allowance and other related programs.

The material, supported by 93 pages of charts, was drawn primarily from foreign laws or authoritative translations. It was supplemented by foreign service dispatches of the tions of the International Labor Office, the International Social Security Association, and social security agencies of foreign countries. Many of the summaries have been approved by social security officials in the countries concerned.

Proceedings, 1958 Annual Conference, Surgeon General, Public Health Service and Chief, Children's Bureau, With State and Territorial Health Officers. PHS Publication No. 653; 1959; 56 pages. Includes remarks and addresses by the Secretary, Department of Health, Education, and Welfare, the Surgeon General, Public Health Service, the Chief. Children's Bureau, and the Chief. Division of Special Health Services, Bureau of State Services. Presents recommendations on Federal relations, environmental sanitation, infectious disease, hospitals and mental health, special health and medical services, long-term illness and health of the aging, Indian health, and migrant labor. Contains resolutions adopted by the Association of State and Territorial Health Officers.

More Than Bread. Social Security Administration Publication numbered); 1958; by Helen C. Manning; 24 pages; 15 cents.

Directed to community leaders. civic groups, and others interested in community welfare, this booklet describes social services in public assistance. It offers suggestions for community projects designed to increase understanding and support of social services.

Vignettes are used to show responsibilities shared by public welfare agencies and the community for helping needy people. The results achieved through social services are highlighted in reports of projects conducted in several States.

In addition to copies for sale by the Superintendent of Documents (see note below) free copies in limited quantities may be obtained from the Office of the Assistant to the Director, Bureau of Public Assistance, Social Security Administration, Washington 25, D.C.

Reported Tuberculosis Data. Calendar year 1956. PHS Publication No. 638; 1959; by Lawrence W. Shaw and Paul L. Roney; 25 pages; 25 cents.

This fifth annual summary presents data supplied to the Public Health Service on the Annual Tuberculosis Report by the States and Territories. The data cover newly reported tuberculosis cases for each State by source of morbidity report, activity status, form and extent of the disease, race, sex, and age as well as X-ray casefinding activities and mortality.

Summary tables present United States totals for the years 1952 through 1956, and accompanying text points out pertinent characteristics inherent in the data.

Better Teeth for Life-Fluoridation. PHS Publication No. 636; 1958; 16 pages; 15 cents.

This popularly written booklet tells the story of the research that led to fluoridation of public water supplies. It also outlines the seriousness of the dental health problem and summarizes the progress of fluoridation in this country and abroad.

This section carries announcements of new publications prepared by the Public Health Service and of selected publications prepared with Federal support.

Unless otherwise indicated, publications for which prices are quoted are for sale by the Superintendent of Documents, U. S. Government Printing Office, Washington 25. D. C. Orders should be accompanied by cash, check, or money order and should fully identify the publication. Health Service publications which do not carry price quotations, as well as single sample copies of those for which prices are shown, can be obtained without charge from the Public Inquiries Branch, Office of Information, Public Health Service, Washington 25, D. C.

The Public Health Service does not supply publications other than its own.

Signs

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Symptoms

of trends in public health

Radiation from some luminous watches is "several times greater than natural background radiation and exceeds by more than 100 times that presently received from radioactive fallout," reported G. D. Chase and A. Osol in the October 1958 issue of *Science*.

In 5 years, they found, one is subjected to a dose of 5 rem; the International Commission of Radiation Protection recommends no dose in excess of 5 rem by age 30.

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Local 88 Medical Institute, a new medical center in St. Louis, Mo., financed with health and welfare funds of the Meat Cutters Union, Local 88, was dedicated in October, during the 86th APHA conference.

National Science Foundation says survey of 127,000 American scientists showed that three out of four know at least one foreign language. Only about 2 percent have some knowledge of Russian, and 1 percent know Chinese or Japanese.

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The division of sanitary engineering, Pennsylvania Department of Health, has published a pamphlet entitled, "Your Clean Streams Program."

Dr. Charles S. Cameron, dean, Hahnemann Medical College, has called for a permanent national commission to recommend and coordinate medical research and indicate the relative emphasis to be placed in each field. It should be possible, he says, to agree reasonably on the relative importance of, say, cerebral

palsy and better teeth.

The North Carolina State Board of Health has issued a 527-page, indexed volume on Public Health and Related Laws of North Carolina.

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Twenty new medical schools would have to be added to the 87 now existing or planned if the 1955 ratio of 131.9 physicians per 100,000 population is to be maintained in 1975, G. St.J. Perrott and M. Y. Pennell report in the Journal of Medical Education, September 1958. They also point out that the Association of American Medical Colleges has advocated the establishment of new 2-year schools of basic medical sciences as a means of increasing the enrollment of third-year classes of existing medical schools by 400 students each year.

Forty-five State health departments now recognize accident prevention as a public health responsibility and engage in some degree of activity; 13 departments have a full-time accident prevention staff of one or more persons.

About 50 million people suffer "accidental" injury yearly, the National Health Survey, Public Health Service, reports after a 6-month study. About 40 percent are injured at home, 17 percent at work, and 10 percent by motor vehicles. The remaining 33 percent suffer accidents from other causes, including those in public places during recreation.

Automobile Safety is a new, 8page, quarterly, published by the Automobile Manufacturers Association. A manual entitled "Emergency Childbirth" has been written by Dr. Gregory J. White, and published by the Police Training Foundation, Franklin Park, Ill.

Britons, in addition to their government's free medical service, now can buy medical insurance which includes the services of family physicians.

With the aim of discovering clues to prematurity and malformations at birth, the University of Pittsburgh Graduate School of Public Health has received \$60,000 from the National Institutes of Health, Public Health Service, and the Association for the Aid of Crippled Children to study methods of obtaining accurate, scientifically useful information from pregnant women. Two hundred women from the Pittsburgh area will be asked questions on their daily eating habits, physical activity, and characteristic symptoms.

The British Occupational Hygiene Society is organizing an international symposium on Inhaled Particles and Vapors for April 1960. Those wishing to contribute papers should notify W. H. Walton, Worton Hall, Worton Road, Isleworth, Middlesex, England.

Use of closed-circuit TV for training and instruction in science may be enhanced by Eidophor, a device which projects an image in color on a screen wider than 13 feet. The instruments promise advantages in resolution, definition, and color fidelity.

The Atomic Energy Commission has announced a plan (subject to hearing) to license a Texas corporation to collect and prepackage low-level radioactive waste, encase it in reinforced concrete, and sink it at least 6,000 feet in the Gulf of Mexico about 180 miles south of Galveston, beyond the Continental Shelf. It is presumed that, even if the packages break, the radioactivity of surface water would not rise above permissible levels.

The Nation's first clearly established case of rabies infection in a human from a bat's bite was reported in December 1958 by the California State Health Department.

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The Atomic Energy Commission announced in November 1958 that it will report to the public on radiation accidents which took place in plants operating under licenses from the Commission. The Commission also plans to publicize special reports from licensees on safety matters.

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A program of integrated training for law and medical students in Massachusetts is being set up with the assistance of Professor William J. Curran, Medical Research Institute, Boston University. The training will help physicians become better witnesses in court and help lawyers to conduct questioning with better understanding of medicolegal cases.

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Maternal mortality rate in this country has declined 93 percent in the last four decades—from 1 death in 165 live births in 1915 to 1 death in approximately 2,300 live births today.

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For the first time, a serial research publication, entitled "Wildlife Disease," is being issued in microfilm. The first copy appeared in January 1959. Original manuscripts are printed on 3" x 5" cards. A maximum of 47 pages of text are printed on each card. No more than one article appears on a card.

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Highway fatalities declined in 1958 for the second consecutive year. In 1957 there were 1,100 fewer highway fatalities than in 1956 when a record of 39,600 was set. In 1958 fatalities declined another 1,500 to 37,000.

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Vitamin preparations are the subject of a comprehensive report by the American Medical Association Council on Foods and Nutrition, published in full in the January 3, 1959, issue of the Journal of the American Medical Association.

Twelve home accident prevention seminars, sponsored by the Tennessee Department of Public Health, were held in a number of counties in that State during 1958. Exhibits, informational materials from insurance companies, and films accompanied talks and discussions.

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The Army has developed an emergency medical packet for use in treating mass casualties, civilian or military. It will be used by all three services. The packet has 23 items and medical material adequate to care for 100 casualties in 72 hours. The container is light and inexpensive, easily identified by color or symbol, and may be sealed against tampering. It is easily carried by one person.

A countywide glaucoma and diabetes screening survey was conducted in rural Graham County in western Kansas during April 1958. Of the 593 persons over 40 years of age screened for glaucoma, 23 were referred for further examination. Eleven of those referred were diagnosed as having the disease. Of the 694 persons over 35 years of age tested for diabetes, 22 were found to be positive.

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Fellowships in human ecology and its relation to health have been established by Cornell University Medical College. Inquiries should be addressed to Dr. E. Hugh Luckey, New York Hospital-Cornell Medical Center, 525 East 68th St., New York 21. N.Y.



State police conducted rigid carbon monoxide detection tests on 8,000 school buses throughout Pennsylvania during August 1958. Buses with even a trace of carbon monoxide were held for special inspection of the exhaust system.

Air samples from the front and rear of buses were taken with a

hand-held instrument equipped with a sensitive detector tube (see illustration). If carbon monoxide is present, the contents of the tube turn green. The amount of carbon dioxide present is indicated by the intensity of color, which is compared with a color scale mounted beside the tube.

from public health reports

AN EPIDEMIC OF A SEVERE PNEUMONITIS IN THE BAYOU REGION OF LOUISIANA

By B. J. Olson, Surgeon, United States Public Health Service, and W. L. TREUTING, Director, Division of Preventive Medicine, Louisiana State Department of Health

I. EPIDEMIOLOGICAL STUDY

This report concerns an epidemic of a severe pneumonitis which occurred in 6 scattered parishes of Louisiana over a total area of approximately 20,000 square miles. The disease was recognized as an entity only after an epidemiological study of 3 cases was begun on March 8, 1943. This particular variety of pneumonitis was unusual in that it spread among nursing contacts of cases and had a high mortality—8 deaths in 19 recognized cases.

The initial case was the wife of a trapper living 3 miles east of Creole on the Little Chenier, Cameron Parish (figs. 1 and 2). On December 4, 1942, this individual (case 1) developed an acute febrile illness at her home, became progressively worse, and was transferred to a sanatorium in Ville Platte, La., 120 miles northeast of Creole, where she expired on December 18, 1942. One nurse who had attended her became ill with a similar acute illness on December 24, 1942, and died on January 6, 1943 (case 2). The husband of case 1, who had remained in close attendance during her illness, returned to his home, where he became ill on December 24, 1942 (case 3), and died on January 26, 1943. An elderly man who was hospitalized in the sanatorium in a room adjacent to that occupied by case 1 developed a pneumonitis after leaving the sanatorium and recovered after a severe illness of long duration (case 4).

Case 2 was treated in the sanatorium and gave rise to six secondary cases of the disease in nurses or in individuals who acted as nurses during her illness (cases 5, 6, 7, 8, 9, 10). Of this series, cases 7 and 8 were treated in the sanatorium; cases 5, 6, and 9 in their homes

2 Presented to the Louisiana State Medical Society, April 25, 1944.

OCTOBER 6, 1944, pp. 1299-1311

B. J. Olson and W. L. Treuting and others in a series of seven studies isolated and described an agent belonging to the psittacosis-lymphogranuloma venereum group of viruses.

¹ From the Division of Infectious Diseases, National Institute of Health, and the Louisiana State Department of Health.